AN ATLAS OF ECONOMIC GEOGRAPHY

BY

J. G. BARTHOLOMEW, LL.D.

VICTORIA GOLD MEDALLIST OF THE ROYAL GEOGRAPHICAL SOCIETY

WITH INTRODUCTION BY

L. W. LYDE, M.A.

PROFESSOR OF ECONOMIC GEOGRAPHY IN UNIVERSITY COLLEGE, LONDON

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THE PHYSICAL AND POLITICAL SCHOOL ATLAS

By J. G. BARTHOLOMEW

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INTRODUCTION

PART I. GENERAL

There is only one strictly educational end in the study of Geography, and that is the training of the imagination, so that it may be able to picture truly forms and forces beyond one's immediate horizon, especially distant lands and foreign peoples. There is, therefore, no essential difference in the end in view, the principles involved, and the method to be used, whether the subject is studied from the economic or the historic or any other special point of view. The only difference is occasionally a slight difference in the choice of the subject-matter; and, as a matter of fact, such details as commercial products are always incidental and often absolutely immaterial. Indeed, if the Human Note is always and everywhere the really important thing, the same Atlas ought to be of use whatever the special point of view—historic, economic, or political.

From such a point of view Historical Geography is in no sense a mere statement of historic sites, e.g. of battlefields, capitals, political frontiers. On the contrary, these are of relatively little importance. It is the character of a frontier rather than its particular position that is of vital importance, as a rule. The original idea in a frontier was only the limit of the area from which the people living within it could obtain the necessary supplies of food. This necessitated a minimum of area. But safety was as essential as size to survival, and rights of pasture were pushed up to conspicuous natural features, especially such as were protective—preventing intrusion and encouraging full use of all resources inside them and the development of a marked physical type and of a marked group-consciousness. A true Historical Geography accounts for the particular development of a particular people in a particular area—e.g. sailors, miners, farmers, or Danes, Japanese, Araucanians. Its essential value is to give perspective—the great desideratum in these days of city life, when our mental vision is so often, like our physical vision, limited to the narrow city streets, with the consequent absence of distant values and a corresponding lack of prudence and of patriotism.

The natural sequel to such an interpretation of Historical Geography is in a Political Geography which relates a national type to its natural environment; and the power to picture truly the 'setting' of foreign peoples in distant lands ought to have as much value in solving the political problems of nations as in promoting the business success of individuals.

The complementary attitude is found in an Economic Geography which is not merely a knowledge of where products are found or handled, but which presents the world as an economic unit, with each type—e.g. sailors, miners, farmers, or Danes, Japanese, Araucanians—in its place. This keeps one's fingers on the pulse of the world, and is a fine corrective of parochialism and jingoism.

Geographic Principles and Processes.

The fundamental principles and processes of the Science are few and comparatively simple. By fundamental principles, I mean the great comprehensive truths which essentially condition the life of Man on the Earth; and they are three in number: the physical relation of land and water, the climatic relation of wind and sun, the physiological relation of the organism to its environment. And, in the first instance, I think that it is helpful to limit one's attention to quite a few aspects; for the attitude of mind is of more importance than the body of knowledge which it presupposes. For instance, in analysing the physical relation of land and water, attention may be usefully confined at first to relief features of the first order, the continents and oceans; and their relation may be studied as epitomized in two features, the Continental Shelf and the World water-parting.

In the same way the fundamental processes may be limited to three: the Fundamental Geographic Process ('how the sun lifts the water from the ocean, how the air carries the water to the land, how the land sends the water back again to the ocean'), and its two corollaries of land-building and river-work; and, in studying them, attention may be usefully confined at first to relief features of the second order, i.e. such land-forms as plateaus, mountains, plains, &c. Study of industrial and commercial phenomena, by its simultaneous concentration on causes and results, often illustrates these principles and processes better than similar study of merely political and historic phenomena.

Arrangement of Maps.

The arrangement of the maps is a compromise between ideal and mechanical conditions. The earlier maps embody the great world-principles which make the necessary minimum and foundation, and they 'hang together' fairly well; but occasionally a double-page map must intervene between two single-page maps which ought, ideally, to go absolutely side by side. The later maps, being only economic diagrams, are, of course, useless—or even harmful—educationally, unless used in close connexion with the physical and climatic maps which precede them; but the expense of embodying all the phenomena on a separate plate in each case would have been quite prohibitive, and

the nearest approach to that was to give economic maps, e. g. of general vegetation and population, beside climatic and orographical maps, in the double-page series of surveys of the various continents.

A long and unexpected delay occurred between the printing of the general maps and some of the more detailed ones. There are, therefore, some discrepancies; and, of course, in each case the fuller and later information is embodied in the later and more detailed maps, i.e. those with *lettered* numbers, such as 34[B] and 42[A].

Where there are duplicate maps, some variant spellings have been given, but it has not been possible to do this on a large scale. Generally the spelling adopted is not what we consider the best in itself, but it is the one which most facilitates reference to the various Reports of commerce and industry in our colonies and in foreign countries.

Practically all the Economic and Distribution maps of the World are on Gall's Stereographic Cylindrical Projection. This projection has the advantage of representing the relative areas of different parts of the earth's surface with approximate correctness, although distortion of shapes is unavoidable towards the Poles. The Orographical, Commercial, and Political maps of the World are on Mercator's Projection, its essential defect being—from the purely economic point of view—so far useful in that it helps to give a correct idea, by its exaggeration of the size, of the relatively overwhelming importance of the North Temperate Zone. That is, of course, the most important part of the great land hemisphere; for the enormous majority of economic products are derived from the land, and the North Temperate Zone was the scene and the source of the earliest stages of economic progress for man. The absence of mountains running north and south in the west of Europe, and the presence of a Monsoon area in the east of Asia, were responsible for the distribution of plant and animal life which led to the relatively speedy development of Man in the 'Culture Zone of Eurasia', i. e. an area lying roughly between lines joining Glasgow to Hakodate and the Canary Islands to Formosa (Taiwan).

Commercial Growth of Nations.

P. 1. It is only such an interpretation of the aspects of Geography that gives any educational value to, and therefore justifies the presence of, such a chart as that on p. 1. That is really a historic summary of the balance of political and economic factors understood in the sense used above; its background is (*a*) the reasons for the particular development in the particular area, (*b*) the relation of the people to the place, (*c*) the relation of the part to the whole, i.e. the World. Obviously, the various spheres overlap. The sea is the mother of freedom, whether economic or political; there can be no safe political freedom unless economic freedom is guaranteed, so that—where a country is not self-contained (cf. ancient Athens or modern England)—connexion with outside sources of supply must be maintained at all costs. Tariff defence of home industries and tariff support of relatively unimportant home industries, the reasons for acquiring colonial possessions and the processes of acquiring them, are—from this point of view—legitimate topics in Historical Geography. But the word *Economic* in its widest sense covers all these aspects; and it was in this sense that it was applied by University College, London, to the first separate Chair of Geography which was instituted in this country.

The chart should be compared with the map on pp. 10 and 11; for this development has not been confined to the nations here mentioned, nor has it been entirely dependent on improved means of commercial transport. It has been intensive as well as extensive, and the growth since the beginning of the century has been more rapid than ever before. For instance, amongst nations not mentioned on p. 1, the import trade of Argentina has increased more than 200 per cent., and those of Brazil, Canada, and Chile have increased more than 150 per cent., while that of Japan has exceeded, and that of Italy has nearly reached, 100 per cent. The export trade does not show quite such a vast increase; but that of China has exceeded, and those of Russia, Chile, Algeria, Mexico, and Argentina, have nearly reached, 100 per cent.

Bathy-Orographical Chart.

Pp. 2–3. The greatest commercial nations of the world owe their position mainly to the Atlantic; and, to appreciate the reason of the unique importance of the Atlantic, we need to look at a World map with the Pacific in the centre. Then, if we trace the general course of the great water-parting between the Atlantic and the Indo-Pacific Oceans, we find that we have divided the world into two fairly equal parts; and the smaller ocean must obviously have the larger feeding basin. That is to say, almost all the really important rivers in the world empty across the great plains of the world, into the Atlantic.

This is practically true even of the Atlantic in its narrowest sense, and literally true if we include the Arctic Ocean, with its Siberian and Canadian drainage; and the Atlantic has much better claim than the Pacific to the Arctic hinterland. Between East Cape and Prince of Wales Cape, Behring Strait is not 40 miles wide nor 200 feet deep, while there are 1,000 miles of ocean between Norway and Greenland, and Davis Strait at its narrowest is at least 150 miles wide.

The areas coloured green or white are—outside polar regions—specially important. The original home of all important animal forms was near the shore-line, certainly not more than about 660 feet above or below ocean level; and since the distribution of land and water has been that to which we are accustomed, the shallow seas have been the scenes of all the great fishing-grounds, as their shores have been the homes of all the great fishing-races; and to-day all the great commercial cities of the world stand on the low land. This is the reason for the supreme importance of the Continental Shelf in the history of civilization. For the Shelf, as the physical link between land and sea, naturally expresses itself in islands and in seas shallow enough for fishing; and the Human Note is the same in both. The

islanders were the first deep-sea fishermen, and their special industry—by the prominence given on shore to the women in the absence of the men at sea—gave a base for all that was best in political life, because based on the equality of man and woman in the family, and of man and man in the jointly owned boat. This boat, in its finest and fastest development, was the schooner of the North Atlantic 'Banks'.

The map shows how gentle the landward slope of the Continental Shelf is, and how abrupt the seaward slope; for instance, the distance between Haiti and the Brownson deep is only 300 miles, but the difference of extreme level is 38,000 feet. And it is this sudden increase of depth which confines the fish almost entirely to the Shelf; for below a depth of 100 fathoms there is not sufficient light for the algae on which, or amongst which, they find their main supplies of food. As the number 666 ('the Mark of the Beast') has a very old association with animal life, 666 feet may perhaps be adopted as the equivalent of the 100-fathom line.

Temperature Maps.

P. 4. Of course all the isotherms, as here given, are reduced to sea-level temperatures; and, therefore, they need to be corrected by the land heights of the previous map before they give correct ideas of the actual temperature. That is to say, all the land on that map which is not coloured green has a temperature at least 2° lower than the corresponding isotherms on this page indicate.

Close comparison of the winter and summer isotherms, especially over the land, will show how misleading a mean temperature may be except for an oceanic area; indeed, some places never have their allotted 'mean temperature'—except perhaps for a day or two in spring or autumn.

These isotherm maps, like all the other maps, require to be read in close connexion with allied maps before they become really clear or illuminating. For instance, reference to p. 4[A] shows the limits inside which the actual sun-heat is wasted in melting ice at the sea-level—a main cause for the temperature on the Antarctic continent seldom reaching 30° F. even in summer; reference to p. 5 shows how winds may (*a*) carry oceanic influences inland, e.g. in Western Europe, or (*b*) carry continental influences seaward, e.g. off Eastern Asia; reference again to pp. 6–7 shows how the lowering of temperature is largely due (*a*) off the west coasts of the southern hemisphere to the upwelling of cold water where the Trade-winds swoop on to the ocean, and (*b*) off the east coasts of the northern hemisphere to the presence of cold surface currents from Polar regions. Generally, it appears that, as the direct influence of the sun decreases, the isotherms coincide less and less with parallels of latitude except over the Southern Ocean.

This may be usefully emphasized by calling them 'sea-lines' in winter, when the sea is the dominant factor, and 'sun-lines' in summer, when the sun is the dominant factor; and the southern hemisphere offers some interesting illustrations. For instance, in South America sea and sun combine to draw the isotherms parallel to the 'northern' coast in the northern summer and to the 'southern' coast in the southern summer. In Australia, during the southern summer half the continent is under the influence of the Monsoon, i.e. is really dominated by an *ocean* influence, and the isotherms in that half run parallel with the nearest coast, while outside the influences of the Monsoon the sun is supreme, and the isotherms correspond generally with lines of latitude.

P. 4[A]. The value of such maps as these on p. 4 is mainly to estimate the influence of (*a*) land and sea, as shown e.g. by the gradation of colour along the Arctic Circle from 120 E. to 0° in the January map, and (*b*) latitude, which gives—very broadly—a variation of nearly 20° F. for every 1,000 miles. But what we really need is the Human Note, which is essentially concerned with the actual temperature, as given on p. 4[A]. Obviously, quite different occupations, especially in relation to cultivation, are suited to areas which have cold winters (under 32° F.) associated with (*a*) hot summers (over 68° F.) as in parts of U.S.A., Russia, and Manchuria, or (*b*) warm summers (over 50° F.), as in parts of Canada, France, and Siberia, or (*c*) cool summers (under 50° F.), as in Alaska and on parts of the Andean plateau. Contrariwise, on other parts of this plateau, the afternoon temperature practically all the year round reaches 66° F.; and, therefore, maize can be ripened there—9,000 feet above the sea. This is the area of so-called 'eternal spring'. But it is better described as having 'daily samples of spring, summer, and winter'. The great height involves a low mean annual temperature, but the latitude guarantees that seasonal change will be only slight, while the thin air causes great daily range.

P. 4[B]. The maps of Polar Hemispheres on p. 4[B] usefully supplement those with the Equator in the centre; for they are strictly comparable throughout, and illustrate exceptionally well, e.g. the relative influence of land and water. The Arctic area should be treated essentially as a sea ringed round with the ends of the northern continents, and the Antarctic as a continent ringed round with the ends of the southern oceans. This at once suggests the existence of typical hinterlands in the south—of vast plains behind the Atlantic, of a narrow cordillera-fringed strip behind the Pacific, of broad plateaus behind the Indian Ocean. In comparing the symmetry of the temperature belts in the south with the irregularity of those in the north, as in estimating the influence of the previous season in retarding or accelerating maximum or minimum temperature, reference should be made to the maps of Winds and Ocean Currents (pp. 5–7).

Precipitation Maps.

P. 4[C]. The maps of simultaneous 'winter' and 'summer' precipitation should be supplemented from that on p. 8[A]. Like that, they need to be related to the maps of temperature and pressure (pp. 4 and 5). They isolate, however, the conditions which become important in connexion with the map of cloudiness on the next page. They should be the basis of any study of, e.g. crop-estimates, or the dependence of international commerce on the possession of

supplementary (or complementary) products, or the relation of climatic phenomena in different hemispheres. Thus, there seems to be a definite relation between the velocity of the wind in St. Helena with the rainfall in the south of England and with the flood on the Nile; winter precipitation in Central Siberia varies inversely with that in India the following summer: when the Weddell sea is free from ice, Spitzbergen will be, and there will be drought in both Chile and India.

P. 4^{B}. This map of cloudiness, checked by the previous maps (p. 4^{C}), should be the basis of any study of racial colour. For the essential work of skin-pigment is to protect from nerve-injury, whether to man or to beast; and, therefore, the amount varies with the need. The danger depends on the relative humidity, the actinic power of the sun through dry air—i.e. air far from saturation—being great even in high latitudes. Conversely, just because a high humidity keeps out such a large percentage of direct sun-force, so it also keeps in the heat radiated from the earth's surface, thus greatly curtailing a healthy range of temperature.

If midday sun-force at the Equator during the equinox is 100, its theoretical force in Southern Norway for the winter six months can never be more than 50; but a glance at the map of cloudiness at once reduces that by perhaps 20 or 25 per cent. Indeed, the damp dark forested fiords of Scandinavia have been the race-home of the pure blondes. On the other hand, the pure black skin is the natural product of the dry air of tropical deserts and grasslands. With increase of humidity in the same latitude, and the consequent presence of forest, the black is bleached into a yellowy-black, as in the Krus of the Guinea Coast; with increase of latitude without change of humidity, as on the Bantu savana, real black—on man or zebra—gives place to shades of brown, decreasing in intensity with increase of latitude. The real yellow, or parchment, skin of the Mongol reflects the influence of bright sunlight through dry air, but it is *winter* sunlight; and it is in winter that the Chinese get 'sunburnt'. Conversely, the bright sunlight of the Mediterranean dry season is *summer* sunlight, and produces an almost pure black. When the cloudiness is related to the season of rainfall, it becomes obvious why the Amerinds are not black even in latitudes which elsewhere produce the blackest-skinned people of the world, or why the Japanese are so white-skinned, or why White men must risk serious nerve-injury in tropical Australia.

The fact that the pigment is developed 'according to need' implies that it is essentially fugitive; and this was proved by the interesting disappearance of pigment from the eyes of Captain Scott's crew during their months of exposure to constant Antarctic fog. The particular disappearance of 'pigment' in tropical climates which is shown in pale cheeks, and which may be—and often is—associated with anaemia, is accounted for by the conditions of perspiration. The skin becomes so saturated that the corneous layer of the epidermis softens and thickens, while the high humidity of the air prevents evaporation of the perspiration, and so causes opacity. Behind the survival—under Monsoon alternation of high and low humidity—of 'wheat-coloured' Aryans in India is the fact that they have lived for centuries in thick-walled dimly-lit palaces, and that the mothers of the race go veiled out-of-doors.

The map also gives a bird's-eye view of the areas in which—owing to the low humidity—the recent developments in the use of direct sun-power for mechanical purposes are likely to produce the most important results; and there seems to be little doubt that the whole problem of reclaiming deserts is practically solved.

[For maps on pp. 5–7, see p. vii.]

P. 8^{A}. It is practically true that all the most important economic crops depend on *seasonal* rainfall, which thus becomes actually more important than the total annual fall; but in both cases attention must be paid to such attendant circumstances as affect, e.g. evaporation or the consumption of the supply by plants. Obviously, in the equatorial belt there is a double maximum, maximum fall following each crossing of the equator by the sun at the equinoxes; and a double maximum implies a double minimum, when the sun is farthest from the Equator, i.e. at the two solstices. As the interval between the two maxima decreases with the distance from the Equator, the equatorial rains tend to pass into the so-called tropical rains: and in this case there are said to be only two seasons: a wet season when the sun is overhead, and a dry season when he is farthest away. It seems a pity, however, to state the matter in this way except so far as results are concerned. As a matter of fact, even here there are two maxima: the one when the sun has passed overhead going north, and the other when—*very soon after*—he passes overhead going south; and, except at the extreme limit of his path, there is a definite diminution, if not an actual cessation, of rain between the two maxima. Practically, however, it does mean that there is one short, more or less continuous, wet season, and one very long dry season; and, therefore, this type of rainfall is associated with tropical grasslands, with their short wet 'summer' and their long dry 'winter'.

This explains the apparent contradictions on this map (on p. 8^{A}). On the one hand, in the Doldrums, for instance, it is always summer, 80° F. being a typical temperature near the mouth of the Amazon alike in January and in July; and, on the other hand, an infinitesimal change in fall or an infinitesimal total fall is negligible. This applies to all latitudes. For instance, the fall over the sub-arctic forest of Canada is so small, except in summer, that the area may be coloured indifferently yellow (as it is) or pale red; so all the Selvas might be yellow, for there are convection rains every afternoon. Conversely, the red of the western pampa must be interpreted as 'rain in summer *if at all*'. The same principle holds, of course, in Africa. The whole belt from west of the Lower Niger to the Great Lakes has rain at all seasons, with the maximum in summer (yellow), but the maximum is a double one (bright red); and all eastern Madagascar has some rain at every season, but its specially rainy season is summer, as in South-east of Australia.

P. 9. Mean Annual Rainfall. This map is the natural sequel to the Wind maps on p. 5, when studied in relation to a relief map (pp. 2–3); but, like all 'averages', it may be

very misleading. It does show the connexion between wind and rain, the position of deserts, and the total amount of rainfall; but, as we have seen, the amount is comparatively of little importance, the really vital matter being the seasonal distribution. For instance, the distribution of natural grass-lands is essentially a result of seasonal rainfall; and the climatic control of cultivation (see p. 8) is equally marked, e.g. areas of summer rain being specially suited to grain, areas of winter rain being specially suited to fruit, and so on. This map, therefore, has little or no economic value until it is carefully compared with the Seasonal Rainfall maps on pp. 8[A], 18, 32, 34[A], 36, 40, 44, and 48. And even then one must remember also that (*a*) where cold dry air is falling to lower and warmer levels, there must be a deficiency of rain as well as heavier pressure, e.g. along the 'Calms' of Cancer and of Capricorn, and (*b*) that between these Calms, i.e. roughly in the Tropics, rainfall depends far more on mountains than on cyclonic low-pressure areas. Consequently, we must notice specially (*a*) the presence of great mountain-ranges and plateau scarps running north and south in the Tropics, i.e. athwart the Trade-winds, and (*b*) the distance from the sea at which the westerly winds cease to be rain-bearers in the Temperate Zones.

Pressure Maps.

P. 5. The most instructive parts of these isobaric maps are the Monsoon areas, the essential phenomena of which are, of course, simply those of 'land and sea breezes' on a gigantic scale; or, from the other point of view, 'land and sea breezes' are simply miniature monsoons. Reference to pp. 2–3 will show how the distribution of pressure is affected, not only by the distribution of land and water, but also by the altitude of the land. Reference to pp. 2–3 and 6–7 also throws light on, e.g., the regularity of the isobars in the Southern Ocean (cf. the regularity of the isotherms on p. 4[B]), the presence of a 'high pressure' area over continents in winter, and the presence of a relatively 'high pressure' area over oceans in summer.

The maps show how the rotation of the earth deflects all the regular winds—the warm light winds that travel away from the equator in upper currents, as well as the cold heavy winds that travel to the equator in lower currents; and it is the centrifugal action set up by this rotation that tends to accumulate air—increasing the pressure by about 1 lb. for every 2,500 feet—over the eastern part of each ocean in the lower temperate latitudes. In this connexion, the position of the British Isles with respect to (*a*) the permanent 'high pressure' area off the Azores, and (*b*) the permanent 'low pressure' area off Iceland, is specially worthy of attention.

In each case the permanency and the intensity of the focus are important. On the one hand, there must be a permanent area of high pressure off the Azores because the maximum pressure must be where mechanical and thermal causes combine; the cold Canary current lowers the air temperature and so increases the pressure, and maximum pressure must be found where the high-pressure belt is crossed by the coldest portion of a surface current. On the other hand, the permanence and intensity of the Icelandic centre must be related to the presence in the immediate neighbourhood of the permanent ice of Greenland and Iceland itself. In the corresponding part of the Pacific Ocean, where the summer warmth of Siberia and Alaska prohibits such an ice-control, the focus is not permanent but seasonal, i.e. present only in winter.

Obviously, there must be exactly opposite conditions at the top and the bottom of any column of air at a given focus. If there is low pressure at the surface, there must be high pressure (upwards—against the unchanging, isobaric layers) overhead; and vice versa. And the different columns must be mutually dependent. Thus, the surface high-pressure focus at the Tropic of Cancer feeds on the surface both the equatorial low pressure and the Icelandic low pressure, and it is itself fed from above by the overflow from both. Where the flow is from a latitude where the earth is rotating more slowly to one where it is rotating more quickly, it must 'lag'; therefore, there must be N.E. winds from the North Pole and S.E. winds from the South Pole, just as there are N.E. Trades from the North Tropic and S.E. Trades from the South Tropic. But these are all surface movements, and above them there must be movements in the opposite direction; so there must be westerly winds descending towards the two Poles as towards the two Tropics.

Vegetation Maps.

Pp. 6–7. Reference to p. 5 shows how intimately the great oceanic currents depend on regular winds; and reference to p. 9 shows how the sun-warmed surface water is driven westward by the Trades in the Atlantic to a point from which it can be driven on eastward by the Anti-Trades.[1] It It is almost true to say that the whole story of the British maritime power is summed up in that one statement. The term 'Gulf Stream' should be confined to the stream of salt water (50 miles wide, 2,000 feet deep, and with a temperature of 80° F.) which comes out of the Mexican Gulf through the Florida Strait, and which definitely disappears off the Newfoundland Banks—cut off abruptly during most of the year by the cold Labrador current. Though the current stops, the warm wind-blown drift continues its course eastward until it eventually overflows into the Arctic Ocean—by the same three gaps through which in summer the ice-cold water from the north gravitates southward over the Atlantic. So continuous is the warm-water belt that typical West-Indian fish are caught off Spitzbergen. The use of the term 'Gulf *Stream*' in connexion with European water is, therefore, only verbally incorrect.

The 'Natural Vegetation' on this map depends practically on the distribution of rainfall—deserts being areas of no rain, forests being areas of great rain, and grass-lands being areas of little rain; and, therefore, the wind and rainfall maps (pp. 5 and 9) should be studied carefully *before* the vegetation. In this case, as elsewhere in the Atlas, the best order of the maps for printing need not be followed by the student.

The vegetation colouring should be interpreted in the light of (*a*) the isothermal chart on p. 4, and (*b*) the various charts

[1] The name *Anti-Trade* suggests a double antagonism: (*a*) as here, of direction, and (*b*) of character, as 'Not Steady', i.e. variable.

of product-distribution towards the end of the Atlas. Quite roughly, it is true to say that the poleward limit of sugar-cane is marked by the 70° F. line,—that of olives by the 60° F. line,—that of the vine by the 50° F. line,—that of wheat by the 40° F. line,—and that of conifer forests by the 30° F. line. In this connexion it is important not to exaggerate the influence which currents, whether warm or cold, can exert over neighbouring lands. There may be direct influences, as when the freed-heat of the heavy precipitation from the warm drift increases the low pressure in the Icelandic focus, or when the cold current along the dusty South American coast gives rise to dense fogs. But generally the influence is felt only if, and where, winds blow landward off or over the current.

[This projection, giving practical equality of areas, illustrates also the most important results of the contraction of the earth by secular cooling—contraction from a sphere, i.e. maximum volume with minimum surface, towards a tetrahedron, i.e. minimum volume with maximum surface. The shrinking globe gets rid of its surplus surface by sagging on four sides,—thus forming the four ocean basins, and showing a land ring in the northern hemisphere, a water ring in the southern hemisphere, and a tendency for each continent (i.e. the land elevation where the edges of each pair of triangles meet) to be opposite an ocean (i.e. the sag in the centre of each triangle).

There is, of course, no actual approximation to tetrahedral form. No body with a structure like that of the earth and rotating like the earth could become a complete tetrahedron; for, after each collapse towards the tetrahedron and the consequent adjustment of crust to the shrunken core, there must be a period of quiet during which the spinning body will recover towards the spherical. But shrinkage of core must mean relative surplus of crust, and the figure which is specifically associated with surplus of crust, i.e. maximum surface, is a tetrahedron.]

P. 8. Commercial Cultivation, i.e. production on a huge scale for purposes of trade and commerce, is the latest stage in the development of Man from nomadism through various stages of natural **Forms of Cultivation.** All the most civilized areas have passed through historic stages corresponding to these natural forms; and the predominant influence underlying the conscious specialization for commercial purposes is climate, with its problems of racial strength, labour supply, facilities for transport, &c. Primitive man, historically and economically, is at the mercy of his environment; and his interests are, therefore, local and narrow and almost entirely related to material needs and processes.

For this reason, if for no other, we might classify products in Economic Geography not as Natural and Artificial, i.e. what is provided by Nature for Man without any effort on his part, and what he provides for himself—but as Natural and Unnatural, i.e. those which are, and those which are not, produced under the 'proper' conditions. To use land for unsuitable crops is a waste; but deliberate avoidance of such waste is based on such study of natural conditions as is typical only of advanced stages of civilization.

The maps should be carefully compared with other maps which illustrate the 'control' of Man's activities, especially maps of racial distribution, density of population, seasonal rainfall, and various occupational distributions. Such comparisons will throw light on, e.g., the relation of intensive (horticulture) to extensive agriculture, the relation of both to the value of land, the time relation of agriculture—backward to nomad occupations and forward to urban industries, the relation of economic to political independence (cf. p. iv); and it will be seen that in many cases there is a racial as well as a climatic factor at work.

These maps should be supplemented by the Occupation map on p. 12 (cf. p. x), for the development of Cultivation into Commercial Cultivation is likely to be most rapid where the self-contained and satisfied adept is converted into the producer of a surplus.

Ocean Salinity and Temperature.

[For map on p. 8[A] see p. vi.]

P. 8[B]. This map is the complement of that on p. 8[A]. In the Horse Latitudes dry, cold, heavy air is descending; and, in doing so, it is warmed both by compression and by passing into warmer layers. The part of this descending current which is drawn in again to the equator as a Trade wind, is blowing from cooler to warmer latitudes; and it is, therefore, always 'dry', i.e. far from saturation, so that it is 'a rain-drinker rather than a rain-dropper'. Indeed, Trade winds rain only under protest, i.e. only when and where relief causes a forced ascent. There may be, in the Trade-wind belt, rains which are not 'relief rains', but they fall only when the Trades are not blowing, or not blowing strongly. This is well illustrated by the Harmattan phenomena on the Guinea Coast. Even during the Harmattan season (November to March) the difference in the relative humidity on calm days averages up to 22 per cent. higher than on days when the Harmattan is blowing strongly.

The essential factors in the distribution of salinity are precipitation and evaporation (summarized in the maps on p. 9), the inflow of rivers, and the action of wind. The very high salinity of the Levant and the Red Sea reflects mainly the great evaporation and small precipitation of the circum-desert seas. The melting ice of the polar and the constant rain of the equatorial belts, like the river-water of the Mississippi and the Amazon, the Niger and the Congo, are similarly reflected; and off the Niger and Congo shores, as off all shores from which Trade-winds blow, there is clear evidence of the action of these regular winds in driving the warm salt water westward—to be piled[1] up against the eastern shores of the opposite continents.

In the case of the Atlantic, mean maximum temperature and mean minimum pressure are always north of the Equator; and therefore the warm salt drift of the South Atlantic is carried into the North Atlantic, which thus gets a great surplus of warm salt water—on the surface from the South Atlantic as well as below the surface from the Mediterranean. Even the surface of the North Atlantic off the Straits of Gibraltar is, however, very salt, partly because of the permanent anti-cyclonic focus of the Azores.

[1] In the Gulf of Mexico the extra height is 42 inches.

In the case of the Pacific, mean maximum temperature and mean minimum pressure for two-thirds of the year are south of the equator, so that the southern part of that ocean has the higher salinity, with, of course, patches of very high salinity in anti-cyclonic foci.

The most important phenomenon represented on the map is the vast north-eastward extension of the warm salt Gulf-Atlantic Drift, with its focus over the Wyville-Thompson ridge. This is not only of supreme climatic importance to N.W. Europe, but must also be related to (*a*) the westward movement of the cold fresh surface water across the Polar Sea, and (*b*) the relatively high temperature of that sea at the lower levels to which the heavy salt water of the warm drift has sunk beneath the lighter fresh water.

The excess of salinity over the whole Atlantic, as compared with the Pacific or the Indian Ocean, is to be associated with the character of its hinterland (cf. p. iv). The vast plains and peneplains which form that hinterland, not only favour evaporation, especially off great inland seas, but also steal much of the consequent and subsequent precipitation. Thus, the Sahara does not return to the ocean one-millionth part of the supply which it receives from the Atlantic, and Turkestan returns not one drop. In spite, therefore, of almost monopolizing the great rivers of the world, the Atlantic is always giving off more fresh water than it gets back.

P. 9. Ocean Surface Temperatures. Comparison with the maps on p. 4 shows that, in a very general way, land and water are alike in respect of temperature—the temperature of both decreasing with distance from the equator or from sea-level. The important points to notice, therefore, are (*a*) the distance to which relatively warm water pushes poleward in certain parts of the ocean, and relatively cold water pushes equatorward in other parts, and (*b*) the way in which enclosed or partially enclosed seas, e.g. the Mediterranean or the Red Sea, not only attain a very high surface temperature, but are relatively warm even at great depths, whereas in the open ocean the deep water, even in the Tropics, has a temperature very little above freezing-point.

This map requires to be read, therefore, in the light of the fact that, while fresh water has its maximum density at a temperature of just above 39° F., average sea water (salinity of 35 per 1000) has its maximum density at 28° F. Further, it requires to be related to the isobaric maps on p. 5, with their phenomena of wind-direction and foci of maximum and minimum pressure. Thus in the Atlantic and the Eastern Pacific, maximum temperature, like maximum salinity, lies to the north of the equator, while in the Western Pacific it lies to the south. On the other hand, in both, regular winds from higher latitudes lower temperature, e.g. off California and Morocco, where the high-pressure system moves clockwise, and off the Chile and Angola coasts, where it moves anti-clockwise. In winter Nova Scotia gets both N.E. winds off the Icelandic low-pressure focus to the east and N.W. winds off the continental high-pressure focus to the west.

In the Indian Ocean the great dominating factor of the southerly Monsoon involves the flooding of the northern latitudes with warm water, which the much weaker N.E. Trade—even when reinforced by the N.E. Monsoon—does not remove in winter; but where the current is off-shore, it may drive surface water seaward, to be replaced by an upwelling of cold water from below, as in the north-west of the Arabian Sea. The very marked contrast here between the Red Sea and the Arabian Sea is mainly due to the sill which, like that at Gibraltar and at about the same depth (1000–1200 ft.), cuts off the Red Sea from the Indian Ocean, with the result that the Red Sea, like the Mediterranean, varies little in temperature from top to bottom (56° F.).

This, of course, is not the case in the open oceans, where—apart from any regular currents—warm surface water gravitates poleward, and cold polar water creeps below it equatorward. But, obviously, there will be differences in different areas. For instance, the western portions of the oceans in the Tropics have a greater 'depth' of warm water piled up over them by the Trade-winds; and, as a portion of the S.E. Trades penetrates at all seasons into the North Atlantic, that ocean has both a greater expanse and a greater depth of warm water than the South Atlantic (cf. p. viii). Generally it may be stated that the sheet of really warm water (80° F.) is thin, and that the temperature decreases rapidly at first—from *c.* 60° F. at 600 feet to 56° F. at 1,200 feet, and then slowly—to 40° F. at 3,000 feet, after which it falls very slowly to *c.* 35° F. at 13,000 feet.

Though the expanse of dark blue ('below 40° F.') looks vast, it does not really represent more than one-fifth of the whole water-surface of the globe; but the same temperature obtains on the ocean-floors over fully nine-tenths of the whole water-covering of the globe. In the Arctic and Antarctic oceans the extreme bottom temperature is below 30° F., but in the South Atlantic and most of the Pacific it is not below 35° F.

Still more important from the climatic point of view is the range of temperature on the surface. In the open ocean this does not seem to exceed *1° F. in any consecutive twenty-four hours*; the annual extremes in any one area—where in alternate seasons cold polar waters and warm tropical waters alternate—may exceed 50° F.; and the greatest recorded extreme over the whole ocean is only 70° F.—from 26° F. off Nova Scotia to 96° F. in the Persian Gulf. Even this is *not one-third of the greatest extremes recorded on land!*

Economic Maps.

Pp. 10–11. Commercial Development. This map, especially when compared with the relief map on pp. 2–3, is a very significant comment on the importance of the Atlantic. The areas most favourable to the early development of man were essentially agricultural (alluvial)—(*a*) that of summer rains in East-Central Asia, where the winters are hard and bracing, and (*b*) that of winter rains round the Mediterranean, where the winters are mild and enervating; for here easy conditions made early progress almost a natural evolution (cf. p. xii). Ultimate progress, however, was bound to be greatest where conditions strained Man's powers without overstraining them; and this was certainly in essentially temperate, if not in cool-temperate, latitudes.

The areas most favourable to modern development are essentially industrial areas in these same temperate latitudes, i. e. areas with easy access—climatic and commercial—to the ocean, and of a rock-formation old enough to contain real coal. And it was the attempts to find a water route connecting the Mediterranean and the Indies that led to (*a*) the rise of the maritime powers of North-West Europe, (*b*) the discovery and development of the lands round the Atlantic, and (*c*) the domination of the world by the White man.

Man, of course, is the agent of development; but he has different standards of living, e. g. a wheat or rye or rice standard; he has different racial aptitudes, e. g. as White or Yellow, and as belonging to an old or a new community; and he is grouped in different political units (cf. p. xiv).

The important factor is the presence of stimulus, in some shape or form, especially as a seasonal change, e. g. of rain or temperature or both. Perhaps the best stimulus comes from seasonal change of temperature associated with even rainfall, as in Western Europe; for 'winter' is cold. On the contrary, even temperature with seasonal change of rainfall, as in typical 'Mediterranean' latitudes, is somewhat lacking in stimulus because the economic 'winter' is the dry season, which is also hot. In corresponding latitudes on the eastern sides of the continents, Monsoon peoples enjoy seasonal change of both rainfall and temperature, and so are rendered more capable than any others of enduring great variety of climate (cf. p. xi). This is the geographic fact at the bottom of the question of Yellow labour.

P. 12. Density of Population. This map forms a good comment on what has been just said, and should be read in connexion with it; but it has lessons of its own. It suggests, for instance, how inexhaustible is the fertility of the alluvial lands in the Monsoon region of South-East Asia, where heat and rainfall are simultaneous, and make intensive agriculture the natural way of using land which gives a huge return off a small area. But, for this very reason, the area has been unfavourable to development on modern lines. Equally unfavourable have been the irrigation lands, such as the Nile valley: and, historically, these lands have been isolated by the greatest geographical barriers of olden days—mountains, deserts, and seas.

When it is compared with the map on pp. 6 and 7, sparse population is easily related to (*a*) deserts and semi-desert areas—in the absence of great mineral wealth, (*b*) forested areas, and (*c*) areas difficult of access in other ways, e. g. the Bolivian plateau, which is not only isolated but covered with so rare an atmosphere that ordinary Europeans cannot breathe there with anything like ease or comfort. Reference to the map below, with its mining and manufacturing symbols, shows how workable deposits of coal and iron attract labour, and suggests how closely modern development depends on easy access to the ocean, e. g. for climatic influences in textile work and for transport in hardware.

If the map is now compared with those of Mean Annual Rainfall and Natural Vegetation, and if the areas of no rain and of constant rain are then eliminated, one has a basis for discussing the relative value of the undeveloped lands of the world, especially if these lands are studied in connexion with the various product maps, pp. 50–64.

Amongst these undeveloped lands are the great tropical grasslands. The population which they might support can be gauged from the patch of density in the Sudan; and there is no obvious reason why—with reasonable precautions, racial and hygienic (cf. pp. xi–xiii)—the other areas of similar type should not soon be supporting a similar population. Dense population, however, cannot be expected on the intemperate grasslands of high latitudes—however far the polar limit of grain-growing may be pushed.

Occupations of Mankind. This map also should be compared with those of Mean Annual Rainfall and Natural Vegetation, and with that of Density of Population. Hunters and fishermen naturally like to follow their occupations alone, and their lives, like their prey, must be nomad; but the women, being less nomadic than the men, often supplement the results of the chase with those of primitive agriculture. This occurs most often in tropical lands, where the heat and the moisture will give the maximum result from the minimum effort, e. g. the planting of a banana or manioc shoot, and where crops ripen all the year round.

Ordinary agriculture, which begins with the raising of crops from seed, and modern stock-raising, which depends intimately on railway transport, are definitely scientific occupations; and their success makes possible the existence of mining and manufacturing industries. The connexion between the agriculture and the stock-raising is now very close, as stock are fattened on definitely agricultural products, e. g. oil-cake; and neither of them shows its old influence on the dress, dwellings, &c., of the people engaged in it. Railways make it impossible for the modern ranchers to feel the independence, the isolation, the fatalism of the old Steppe nomads; and, as a matter of fact, the modern ranch has not been the successor of an old pastoral industry in the same area.

All the intemperate grasslands of the world were originally scenes of hunting; but only where religious instinct developed early was there an imperious demand for animals for sacrifice *previous* to starting on a hunting expedition. As the obvious means of meeting this difficulty was to preserve the young of beasts which were killed while in the company of their young, the hunter passed into the shepherd. He was still a nomad, but engaged in increasing, not decreasing, the animal population. Wherever this occurred, 'occupational control' seems gradually to have involved the obtuse, stocky frame of the typical pastoral Mongol. Where he did not become a shepherd, as amongst the Amerinds, he did not develop the stocky frame, although in all other respects, e. g. colour and hair-section, he betrays the climatic control of the intemperate grassland.

The first question to ask in connexion with each occupation is simply, What is its precise power to produce, i. e. to satisfy one or more of the world's great needs? The second question is, Are there wants in this area as well as wealth, i. e. needs which cannot be satisfied by the area? Thus, climate and soil are related to political and historic problems.

There is also the question of Occupational Control, which is of great importance in the development of new countries. Obviously, a pastoral industry, with its paramount obligation to milk beasts at regular hours every day, year in, year out, trains a different type from that trained by an agricultural calendar, where a rush of work at seed-time and harvest may be associated with long stretches of idleness between seasons. Nor is the control limited to 'natural' occupations. For instance, amongst the natives of the Sheffield district centuries of experience have bred an instinct which no theoretical knowledge, not even that of the Krupp experts, can rival; for they can 'recognize' by the eye the quality of a piece of metal or the amount of smoke necessary in a flame for reheating steel. Metallurgical analysis can confirm the one, but no process yet known can decide the other. In the development of new lands or the extension of old local industries, success must depend as largely on this principle of Occupational Control as on observation of Natural Vegetation. On the dry lands in the lee of the Rocky Mountains the presence of bunch-grass is a safer guide than any rainfall statistics to the normal rainfall of the area, and so to the possibility of growing certain crops; and the main cause of the success in growing cotton on a commercial scale in Nigeria is that the people have been growing it, on a domestic scale, for centuries.

Politico-Economic Maps.

P. 12 [A]. The map of **Commercial Languages** has really more a historic than a practical value. It reflects the palmy days of Spanish, Portuguese, and Dutch expansion, and perhaps suggests the importance of English and Arabic; but it gives an exaggerated impression of the commercial importance of Russian, and is far from suggesting that Chinese commerce—and even Chinese diplomacy—is largely conducted in English. Its main value, indeed, is as a guide to the language in which advertisements should be printed for *local* distribution in any given area; and its main defect is that it must ignore the distribution of a *lingua franca*, such as Greek or Malay, Turkish or Hausa. Historically, the Turks have been too lazy or too proud to learn foreign tongues, and so subject races have had to learn Turkish; but under such circumstances, as with Ancient Greek, the medium is sure gradually to get rid of everything which interferes with clearness, directness, adaptability. Thus, the ancient Athenian, like the modern Malay, supplied his part of the world with a medium in which he could make himself intelligible more readily and more widely than any of his rivals. Where the language is also in itself soft and musical and easy to learn, as in the case of Turkish and Malay, it obtains a hold out of all proportion to the political or commercial importance of its real owners (cf. racial map on p. 13). Indeed, Yakut, which closely resembles Turkish, has become the *lingua franca* of Eastern Siberia; and the Yakut is the only tribe in that region which is not dying out. On the contrary, English, in spite of its difficulties, has become the *lingua franca* of educated Indians in India.

Climatic Diseases. The three diseases given on this map have probably been more destructive than any others, the dysentery perhaps being the most deadly of the three; and they are very typical, e. g. as being wholly or mainly associated with noxious microscopic fauna or flora, and as having very definite geographic and even topographic limits. Thus, yellow fever is specifically associated with estuaries, and malaria with nurseries of shallow water.

The problem of White settlement and White labour in the tropics has been revolutionized by the recent advance in our knowledge of the microscopic fauna and flora of disease; and it has been proved, e. g. in Panama and Malta, in Mauritius and the Malay States, that all the most deadly tropical diseases are mainly or entirely of parasitic origin, and can be fought with certain success—and even exterminated—by the destruction of the parasite in its intermediary host (Man), by segregation, and by the abolition of appropriate breeding-places for the particular parasite.

This will revolutionize the problem of Coloured Labour. The average 'native' seems to be *more* liable to such diseases than the average White man, and the White man more so than the Yellow man, though the death-rate from malaria in Formosa shows that even the Yellow man—the only human type that is climatically naturalized in all climates from arctic to equatorial—has no racial immunity. But the Black man, who is more suited than any other to tropical labour, has been the curse of the world from the hygienic standpoint, for from him all the most deadly and disgusting diseases (e.g. smallpox, cholera, typhus) seem to have spread over the world. Indeed, the difficult problem of his 'incurable laziness' is now being solved by the knowledge that it is the direct consequence of lifelong martyrdom to hookworm. Freedom from parasitic disease is going, then, to decrease enormously the mortality amongst Negroes and to increase enormously their capacity for work.

This has a double importance; for it ought to remove both any need for White labour in the Tropics and the incentive of high wages to tempt White labour to the Tropics, where at present it actually *pays* to employ it, e.g. in the Queensland sugar plantations. But there is the other side of the question—that European nations are seeking homes for surplus population (amongst whom they hope to find also new markets), and these homes can only be found in the relatively unoccupied areas of the Tropics—unoccupied hitherto because too unhealthy.

The distribution of these diseases is essentially a political question because it really depends on the standard of civilization in the areas in question. As long as Man's struggle for existence is only with other large mammals, e.g. the carnivorous fauna of park-land and savana, even uncivilized peoples can be victorious; but when it comes to be with still more noxious, but microscopic, fauna, civilization must have risen to the use of the microscope before there is any chance of victory. At the back of the problem are questions of cost and experience.

The Panama returns, with a death-rate of *less than 4 per 1,000*, calculated over some 11,000 Whites, prove that—

apart from the question of cost—White labour can be employed with impunity on heavy manual work in the Tropics at a low altitude, even when that work involves the constant turning up of virgin soil rich in noxious microscopic fauna. The Canal zone is less than Bedfordshire, and the cost has averaged £100,000 a year; but yellow fever has been practically abolished, and the death-rate from malaria has been reduced to 1·23 per 1,000. On the Queensland sugar plantations, with a much wider area and much less expenditure, the death-rate is under 12 per 1,000; and the White miners of the Gold Coast—the 'White Man's Grave'—have shown a return of under 15 per 1,000, though this must be discounted by the fact that 60 per 1,000 were invalided home. And even in the least healthy areas the heavy toll of malaria or dysentery should at least be balanced by the absence of such scourges as diphtheria and pneumonia.

Nor must mere theory, e.g. of the German Colonial Office, be overrated, especially when it conflicts with the practical experience of other nations such as the Dutch, who have had actual experience of tropical sanitation for 300 years. For it is clear that, while the dramatic results have been due to more scientific knowledge of the precise causes of, and the remedies for or precautions against, specific parasitic diseases, much has been done by the accumulative effect of long progress in simpler and sounder ways of living and by the facilities given by improved communications for temporary visits to altitudes or latitudes which are not tropical.

It may be taken for granted that White people can live and work—and propagate their stock true to type—in the tropics within certain time-limits, and that any difficulties are mainly due to the indirect action of the climate in favouring a rich growth of noxious microscopic fauna, which are much encouraged by the old tins, barrels, and other receptacles accumulated by people who live largely on imported goods. The strong light may injure the nerves, and the great heat may incapacitate new-comers; but they rarely kill, and do not cause much actual disease, because they seem to evolve certain physiological changes that are protective. These changes must decide the time-limit referred to; and it will probably bear some such relation to the normal duration of life as certain other physiological changes or processes are known to bear. At least, this is true of the maintenance of 'racial identity', e.g. in British pedigree stock in Argentina and of American cotton in Egypt.

The historic instances adduced in support of extension of time (? beyond seven years) are not apposite. The Spaniards found on the Cordilleran plateau a climate exceedingly similar to that of their Castilian race-home, while the 'poor Whites' of Barbados came from the 'ague fens' of East Anglia, and found themselves in 'hurricane latitudes' and on a most porous soil. Indeed, so free is Barbados from malaria that the freedom was attributed to the swarms of little fish known as Millions, which were said to consume all the mosquito larvae!

Pp. 12[B]–12[D]. [These maps are intended merely as comments on the general political controls, as illustrated below in reference to the map on pp. 14–15; and, but for mechanical reasons, they should *follow* that map.]

P. 13. Races of Mankind. This map should be compared with the Climatic maps and with that of the Commercial Development of the World—by the White man from the eastern shores of the North Atlantic.

The three great varieties of Man are specialized forms of a common type, the specific variations being due apparently to the climatic character of the zoological areas over which they respectively spread. The migrations from the common home in the latitude, if not also the longitude, of the East Indies were probably begun before the Great Ice Age, and were not concluded till that Age had completely passed away. In the 300,000 years or so since then the several varieties have formed distinct racial characters by slow adaptation to their special geographic environment; and, quite roughly, we may say that in the Negro we see the geographic control of damp heat, in the Yellow man (whether Mongol or Amerind) we see the geographic control of an essentially continental climate, and in the White man we see the geographic control of a temperate peninsula.

Man was an arboreal primate; like all the other arboreal primates, he was certainly of Old-World origin, and carried on his person evidences of his arboreal environment. Such an environment involves an elongated, or 'simian,' body, and the skull normally corresponds to the character of the body. He was, therefore, long-skulled and—I venture to suggest—like the other primates, wavy-haired. His race-home was somewhere about 'Javanese' latitudes; and his colour, therefore, was darkish brown.

With expansion from tropical forest to intemperate grassland, he gradually lost his simian physique; and, with a precarious food-supply, jaws and jaw-muscles decreased in size and so in their influence on the skull and on the poise of the head. With change of climate came change of skin-colour (cf. p. vi) and need for protection against extremes of cold and of actinic force. Survival was, therefore, to the man whose hair in colour and character gave best protection to the brain beneath. The coal-black hair gave protection from the ultra-violet rays, while its round section gave a minimum exposure of surface to the climate. All over the intemperate grasslands of the world to-day is found this round-skulled parchment-skinned man, with his round-sectioned hair and his round finger-prints. But only in areas where 'domestic' animals were indigenous did he become stocky-framed (cf. p. x). If the unconstricted skull is related to the precarious food-supply, it ceases to be in any way astonishing that abstemious frugality and intellectual efficiency are conspicuous factors on the economic side of the 'Yellow Labour problem'.

This economic importance of race, as of religion, has several aspects. For instance, in the case of the Negro, climatic influences—acting directly and through the typical food—lead to the early closing of the 'seams' between the bones of the skull; and thus the development of the brain is arrested, and the adult is essentially unintellectual. On the other hand, he is naturally 'acclimatized', more or less, against numerous diseases and other conditions of life and work

which are very adverse to the White man. He should be, therefore, of great use as a manual labourer in a 'steamy' climate, e. g. on a cane-sugar plantation.

The most important aspect of the map, however, seems to be its value as a base for schemes of tropical colonization; and for this purpose it should be compared with that of 'Diseases' on p. 12[A] (cf. p. xi).

With the problem of health solved, the other problem—of new homes for surplus population and new markets for surplus products—presses; and it is really a question of climatic naturalization, which must be preceded by normal acclimatization. The latter is specifically an economic question, and the former a political question; and the essential difference is in the absence of a time-limit, for the naturalization must be *permanent*. This at once raises the question of 'identity'; for, if the price is loss of racial identity, it is prohibitive.

Here is the significance of the essential meaning of the map. There is overwhelming evidence that racial variety has been evolved from a uniform, if not a single, ancestral type by acclimatization and climatic naturalization. Even if there were three or four original types, evolved in separate realms—e. g. the hirsute, high-browed White with the Orang, the short and slender Yellow with the Gibbon, and the Black with the Gorilla—the first descent of the great ice-sheet must have pressed all alike towards 'Javanese' latitudes of the same climatic uniformity, where conspicuous differences must have been reduced to insignificance. But, if racial variety is the result of climatic control, that same control must be still capable of producing such variety—in this case, modifications of the White settlers in the Tropics. If so, is genealogy to be more important than physique? Will a man be accepted as White who has a dark-brown skin and a concave nose? And how will a White race be propagated and survive in a climate which produced such protective adaptations, without them? As a matter of fact, it seems certain that no race can remain permanently true to type under conditions essentially alien to those of its original race-home. (Cf. p. xii.)

Interesting illustrations of this are already to hand. For instance, in North America the 'typical' Negro (i. e. of unadulterated Black blood) is showing such recession of the cheeks as to leave the nose relatively prominent and such elasticity of cranium as to allow its contents to expand normally. In other words, he is approximating in facial outline and in skull-shape—and in intellectual development—to the typical White man; and the process has gone so far as to be obvious at a glance to those who, like Sir Harry Johnston, are familiar with the typical Negro in his African race-home.

The other side of the case is equally instructive; for not only have all the Amerinds always been wonderfully uniform in physical type, if not in language and customs, but also the modern Americans have already approximated to the same type, as the South African Boers have approximated to the type of the Zulu-Xosas 'Kafir.' In the latter case the approximation seems certainly to have included temperament and political control, e. g. patriarchal habits, as well as physique; in the former case the approximation is limited to physique—e. g. the shape of head, the aquiline features, the spare frame and clean limbs, and the tendency of the hair to be so circular in section that it lies quite straight and can show itself on the chin only as a thin and scraggy beard.

As the whole question of Tropical Colonization has been most pressed in Australia, it may be pertinent to point out that the Australian type itself is quite different from that of the Mother Country and the original colonists; for the third generation, with both parents Australian-born, is one with typically jet-black hair and very dark eyes, i. e. is in appearance essentially 'Neapolitan'.

The process of adaptation is, however, very slow. For instance, it is incredible that survival during the Great Ice Age was due to physiological changes so rapid that Man was rendered physically immune; on the contrary, it must have been entirely a matter of 'wits', and the extraordinary rapidity of progress subsequently may perhaps be attributed largely to the 'massacre of fools' by the glaciation. This suggests a further comment on racial possibilities. For, if the process is so slow, immigrant organisms should not be able, as a rule, to adapt themselves to, or be immune from, the strange native fauna; and, contrariwise, the native organisms should not always be able to cope with the immigrant fauna—e. g. of 'European' diseases such as measles.

Under these circumstances the greatest care is needed in introducing native peoples to modern methods of life and work; and there may be cases where—e. g. amongst the natives of the Antipodes—wholesome stimulus arrived too late, and only did harm. The problem is, of course, accentuated by the fatal effect of these European diseases and of European vices, especially drunkenness; and all native peoples seem to suffer equally, whether in New Zealand and Polynesia, or in Australia and Africa, or in North and South America.

Some decimating epidemics, however, which have been attributed to the arrival of Europeans, may have been due to a marked—simultaneous—change in climatic conditions, which led to exceptional swarms of noxious fauna as well as to exceptional crops of rice, or to the lack of both. Thus, drought in India—where considerably more than 8,000,000 persons have died from plague during the last seventeen years—has at least this compensation, that it very quickly shrivels up the infected fleas which carry the disease from rats to men.

Religions of Mankind. There are, of course, direct economic results of religious customs—e. g. a demand for fish in Roman Catholic countries, a demand for coffee (in place of alcohol) in Mohammedan countries, a demand for vegetable (in place of animal) food in Hindustan, &c. But, apart from these broad considerations, religious influences may be most intricate and far-leading; and a map of merely nominal distributions should be carefully compared with other maps which illustrate the control exercised over Man by his environment—e. g. maps of racial and occupational distributions (cf. pp. 8, 12, &c.). As a matter merely of census statistics, the Emperor of India may challenge the claim of the Sultan himself to be called 'Commander of

the Faithful'; and, as solver of an administrative problem, France stands before both.

All depends on what Islam means. Amid the equatorial plantations of the Dutch East Indies it means practically nothing; on the Monsoon plains of British India it means a useful bond between elements which otherwise are racially and economically diverse, if not actually antagonistic; on the scrub and savana lands of French Africa it means a vital, militant, unquenchable hatred of rulers who are alien alike in race and in creed.

Even in the history of Geographical Science—apart from the history of Geographical Discovery, with such names left on the map as Missiones and La Salle—religion was a potent factor. For when the Saracen Horsemen and Shipmen had spread their empire over a quarter of the Earth's circuit, Islam demanded that the Faithful should face Mecca in prayer. Where, in all those 90 degrees of longitude, was Mecca? It was a problem, not of creed but of geography—though Paradise was the end in view; and it was solved as a geographical problem. Then to those who had learnt to connect the noonday sun—so seldom veiled in lands of 'summer' or eternal drought—with both celestial time and terrestrial direction, it was comparatively a small step to go on to teach Geography to their children—of both sexes, and in free schools—*from globes*. But Islam was doing that 500 years before Christianity had ceased burning people for even saying that the earth was round.

[The colouring of Ceylon on the map is, unfortunately, wrong, for the island is naturally and specifically Buddhist. Buddhism is said to hold to Brahmanism much the same relation as Christianity holds to Judaism; and in each case the reaction against the formality and exclusiveness of the older creed was likely to be strongest in the immediate neighbourhood. It was therefore only natural that the purest forms of Buddhism, i. e. of reaction to universal charity and social equality, should be found in the nearest lands to India which were sufficiently cut off by mountains or sea, i. e. in Burma and Ceylon. Out of some 320,000,000 persons in India over 220,000,000 are Hindus and 70,000,000 are Mohammedans, while the Buddhists do not number even 11,000,000. Out of 3,500,000 persons in Ceylon 2,200,000 are Buddhists, and only 500,000 are Hindus.]

Pp. 14–15. This map is, of course, the basis for the maps of Currency, Tariff, Tongue, &c. (cf. p. 12 B, &c.); but I should like to press the value of the political unit. On the one hand, it is impossible to put strict limits to most 'natural regions', for one merges gradually into another. On the other hand, it is almost always the political control that gives the dominant note, even in such a heterogeneous area as Austria-Hungary; and, as the treatment of such areas should be as appropriate as possible to the dominant note, the political unit cannot be made subordinate without more being lost than is gained. Besides, we usually think in political units, and our statistical information, commercial and otherwise, is nearly always 'political'; so that the name of a political unit—e. g. Belgium—comes to be far more than a mere label of a piece of artificially delimited land. It is, indeed, a pivot of associations and suggestions, and more or less epitomises all that the particular nation stands for—in art, literature, science, war, politics, commerce, &c.

Even such matters as tariff and currency, postal and telegraphic communications, reflect the essential environment and character of the given nation; and fixed phenomena, such as equidistant coastal lines, may be just as important as isochronic distances which change with every additional mile of railway brought into use. For trade does follow the flag, and most modern commercial questions have some strategic element involved in them. Thus, the Imperial footholds of Britain on the Suez route are already feeling the effects of the delivery of London letters in Shanghai within the fortnight *via the Trans-Siberian Railway*. The influence of the same line in the spread of Greek Christianity eastwards is illustrated in the map on p. 13.

Pp. 16 and 17. The main contrasts here are (*a*) between the slow evolution of the British areas, as a historic growth, and the rapid development of German areas, as illustrating the concentration of the resources of civilization on a specific object; (*b*) between the old importance of island possessions, whether commercial or naval footholds, and the modern importance of continental interiors; and (*c*) between the typical British colonies of Settlement and the French and German colonies of Exploitation. Behind all these contrasts is the overwhelming importance of Africa in modern times, as the continent of vacant spaces; and railways and 'tropical medicine' are the means which are being successfully used to divert to tropical plateaus the surplus population which hitherto has gone to temperate plains. As France, Holland, and Portugal have not had any surplus to spare, while Germany has lost hundreds of thousands to the New World, the change was likely to be more valuable to Germany than to any other nation. At the same time, the great surplus in Europe now is of non-Teutonic elements, especially Slav; and in this respect colonizers earlier in the field have profited by having acquired the finer type.

PART II—REGIONAL.

Pp. 18, 19. The mechanical arrangement of the maps here, as in other continental series, is meant to pivot on the Orographical map; and that is not only amplified on pp. 26-9, but is intentionally small—so as to present only the simplest generalizations, as the basis of the climate. It was obviously impossible to make the climatic maps *follow* the Orographical map symmetrically in such a series; and it seemed better to give the whole series at a glance than to give a large Orographical map on p. 18, the four climatic maps on p. 19, and the others on a different page.

Europe consists of a belt of old folded highland merging northward (of 50° N.) in a vast area of lowland, and fringed southward by a line of Young Folded Mountains, with a complementary line of maximum depression south again of this line of maximum uplift.

It is a typical piece of Atlantic hinterland, the distribution of relief giving maximum facilities for access—commercial as well as climatic—to and from the ocean, and the character of the relief minimizing the obstacles to movement north or south between 'summer-rain' and 'summer-drought' Europe. Indeed, as a peninsula of peninsulas, it is almost an epitome and climax of Atlantic advantages.

The Political map suggests, however, how greatly the peninsular forms are adverse to the existence of large political units, because the apparent unity of form is contradicted by the physical history. As half-submerged highland areas they have the highest line of the old highland as a backbone, from which human associations, like rivers, are thrown off in opposite directions; so that the marginal peoples east-and-west have always been more or less separated. As the peninsulas run north-and-south, there was added to the political disunity an economic disunity, founded on the different climate and consequent occupations and economic interests at the extreme ends.

At the same time, as a continent, the area is essentially transitional in climate, especially in relation to its wind-system; and so it became self-contained in very early centuries, the west being complementary of the east in temperature-range and the north being complementary of the south in seasonal rainfall. The 'summer drought' was specially favourable to Early Man because it was adverse to any strong plant or animal associations, and allowed him to use fire with great effect against the former.

Reference to the general maps throws further light on the commercial value of a position from which Trade-winds blow in summer, and to which Anti-Trade winds blow in winter, over the narrowest ocean on the globe. But these conditions were relatively inoperative east of a line drawn through Constantinople and Copenhagen; for west of that the distribution of the highlands causes minimum interference with access to and from the Atlantic, while the 'Alpine' character causes minimum interference with intercourse between north and south. But the east is isolated by continental distances, which isolate climatically as well as commercially.

Comparison with the seasonal temperatures and rainfalls of the general maps (pp. 4 and 8[A]) would show that the mean annual temperature falls steadily from south to north and from west to east; but it is nowhere extreme for any great length of time, very little of the area having, e. g. a summer *season* of over 68° F. The same is true of the rainfall, very little of the area getting more than sixty inches or less than twelve; and two-thirds gets summer rain, while one-third gets winter rain, the seaward end of both belts getting also autumn rain; for the sea goes on evaporating after the land has cooled.

Economic Map.

Pp. 20–21. In these detailed Economic and Industrial maps, as in the corresponding maps of the other continents, the relative importance of products can scarcely be judged except by reference to the Population map. For instance, typical exports of grain come only from countries where the population (*a*) is not dense, and (*b*) does not consume the particular grain as its standard bread-stuff; thus, wheat is a typical export from Russia, with its relatively scanty, rye-eating population. Again, fine textile work, especially in cotton and flax, always has a climatic basis, a damp climate being absolutely essential to the spinning of really fine yarn; so that, e. g., cotton and linen manufactures far inland must be mainly of coarse or open-work fabrics, and probably depend on imports of foreign yarn. (Cf. pp. 26, 27.)

The colouring on p. 20, as on similar maps throughout the atlas, must not be considered final or exclusive. For instance, barley is ripened 150 miles inside the Arctic Circle, and wheat is by no means confined to the areas enclosed in blue lines (cf. p. 51)—though its limits in Europe are not constantly being *extended*, as on the great intemperate grass-lands of the New World. The colouring does, however, indicate the most important of the areas in question.

Here, as with the similar maps of the other continents, we are mainly concerned with regional peculiarities; for instance, Russia is the greatest producer of the four 'middle-latitude' cereals (wheat, rye, barley, oats), producing nearly half the world's rye and over 16 per cent. of the three others. The general principles behind the distribution of various products, such as wheat and flax, are dealt with in the text that accompanies the maps of special distributions on pp. 50–64 (cf. pp. xlix, &c.); but, of course, regional conditions often cause marked modifications. For instance,

though both wheat and barley seem to be natives of the Mediterranean basin, with its—for them—ideal climate of cool moist winter and dry hot summer, the amount grown in the area is quite insignificant, except for wheat in Italy. And even there, though the total yield approaches 200,000,000 bushels, the yield per acre does not much exceed 13. This low yield is due mainly to poor farming, and the same cause—along with the small percentage of suitable land—accounts for the small output from the rest of the Mediterranean area.

'Summer-rain' Europe, however, amply compensates for the deficiency of 'summer-drought' Europe, so that the continent stands far ahead of any other for its output of **wheat**. Indeed, though Europe is not much larger than either Canada or the United States, it produces more than twice as much wheat as the whole of North America, i. e. considerably more than half the whole crop of the World.

The great producers are Russia and France, and between them they sum up European conditions. For Western Europe is the great buyer of wheat—for its dense manufacturing populations, while the rich wheat-lands of South-eastern Europe have sparse population and easy access to the Black Sea. Of course, where population is densest demand for bread is most urgent; and Belgium, with the densest population in Europe, shows—under spade tillage—the highest yield per acre in the world (over 40 bushels). This is raised, however, at a high cost of both manure and rent: and in the case of France only a high tariff enables the country to be practically independent—in most years—of foreign supplies. All the manufacturing peoples of Europe have, in a similar way, raised their yield per acre to a high figure—e.g. over 34 bushels in England and Switzerland, nearly 33 in Holland, and over 30 in Germany: but it is only in England and France that the population is specifically *wheat-eating*. As France, with an output of over 300,000,000 bushels, is practically self-supporting, England remains as the great buyer of wheat. There is, however, a complicating factor in the actual Trade Returns, for wheat may be imported in one form and exported in another, or imported in one part of a large country and exported from another part. Thus, in 1912, France imported some 3,000,000 quarters, but only *c.* 7 per cent. of it was retained for home use.

In Italy there is an obvious 'contradiction' between the percentage of land under wheat and the yield per acre (only 13 bushels); but this is due partly to the fact that both in Tuscany and in Venetia it is grown as a spring crop and intentionally 'crowded', because it is grown for straw (in the straw-plait industry), and a 'leggy' and pliable stem is the one essential. The macaroni wheat of Italy is grown in the droughty south-east, but does not nearly supply the industry: for instance, in some years Russian wheat is imported to a value of over £9,000,000! The 'Granary of Spain' round Valladolid is in 'macaroni' latitudes; but wheat is only grown here in virtue of (*a*) the very heavy subsoil of the Pisuerga basin, and (*b*) the facilities for irrigation, for the actual rainfall is only *c.* 12 inches.

The map illustrates (*a*) the wider climatic range of **barley** over wheat from the point of view of humidity as well as temperature, and (*b*) how its heavy yield causes it to be grown as food for animals, especially in dairy areas, e.g. Denmark and Ireland, barley-meal being the best of all foods for pigs; but it scarcely suggests that (*c*) nearly half the European crop is raised in Russia. The absence of barley (on a considerable scale) from the Mediterranean basin—where its large yield and power of resisting drought made it the bread-stuff of the old Greeks and Romans—is due (*a*) to the influence of commerce in bringing cheap 'breads' from younger lands, and (*b*) to the use of the precious alluvial plains for more valuable plants which *must* have the sequence of long moist winter, hot forcing spring, and dry summer.

Wine is more typical than any other product; and Europe is far ahead of all the other continents in both the quantity and the quality of her output. The northern limit of vine-growing for wine, as marked by the red dots, is an economic rather than a climatic line, but increase of summer heat moves it northward—in Prussia to the latitude of Cambridge—while shortness of summer season moves it southward in the more extreme east. In France, Italy, and Iberia it is distinctly a national industry, the three countries producing *c.* five-sixths of the whole World's supply; and, so long as wines are valued by their name, e.g. Champagne or Burgundy, there must be very limited competition even from areas which could produce equally good wine. Such areas are, however, very difficult—in the case of cognac, impossible—to find; for vine-growing is a species of horticulture, dependent on dense population and inherited skill, and very closely related to minute differences of soil and climate. As it also demands expensive 'plant', the combination of wealth, dense population, and a high standard of civilization makes France the greatest wine-producer of the World.

The warm dry slopes which face the wheat-growing lowlands provide a variety of ideal sites for the purpose; and the product varies in character from the claret of the marine to the champagne of the continental exposures, the capacity for effervescence—like the percentage of gluten in wheat—having apparently some obscure connexion with low winter temperature, and therefore increasing north-eastward. The extreme westward site is in the neighbourhood of Saumur, where perfect sparkling wines may be produced in the rare years when the marine influence is not felt till very late in the autumn.

This is also about the northern limit of the most perfect 'still' products, of which the cognac stands unique. Nowhere else in the world, not even with Charente vines on soil identically similar, can the same result be obtained; for nowhere else is the same light rainfall (under 30 inches) associated with a humidity which so filters the sun's rays that the carbides of hydrogen are not oxidized, while the heat is sufficient to ripen the grapes perfectly. To these circumstances is due that preservation of the organic ethers which makes real brandy a 'Water of Life'.

Farther south, the 'Bordeaux' wines have a 10-inch heavier rainfall and a sandier soil; but even inside the small area there are marked differences, e.g. between the (Margaux, Lafite, Latour, &c.) clarets of the marine Médoc

peninsula and the Graves and Sauternes from the lands in the lee of the Landes pine-forests. Only *c.* 3 per cent. of the total output can be classed above *vin ordinaire*; and the percentage amongst the Dordogne 'hill' wines, e.g. St. Emilien, is even less.

In the continental champagne district, with its much greater extremes, exposure becomes increasingly important; and the warm chalk of the hills supplies an abundance of slopes of 30-45° with a south-eastern aspect—these being the two great requirements, e.g. round Reims and Épernay, which sprang into special importance as commanding gaps in the (inner) chalk ring. On the south-eastern slope of the (outer) limestone ring, i.e. on the slopes of the Côte d'Or, the sheltered Saone basin gets 'baked' in summer, like the port-wine valleys of Iberia, and the product is the burgundy type of, e.g. Beaune and Beaujolais. At the extreme south of the Rhine valley, where marine climate is associated with summer-drought, the mixed clay and shingle of Languedoc produce enormous quantities of wine (usually more than one-third of the French total); but the quality is poor.

Italy is in somewhat the same position, being more dependent on the vine and having a larger area under it than any other country, but handicapped by poor quality. This is due, however, as much to bad methods as to the strictly summer-drought latitudes; and this is suggested by the fact that the best wines come from the least backward areas, e.g. the Chianti of Tuscany and the Asti of Piedmont. But the true summer-drought climate is really favourable only to rather heavy types of white wine, such as Marsala, and the vintage-time (September to November) is often wet.

In similar latitudes in Spain, with an Atlantic exposure somewhat similar to that of Charente, the wines of Jerez are again peculiarly rich in organic ethers, the best sherry being almost equal to cognac in this respect; and the climate combines heavy rains in late winter and early spring with dry summer and autumn *without* extremes of temperature. In the valleys of northern Portugal, on the contrary, the vines are simply 'roasted', and consequently produce a wine of resinous quality. In these latitudes, however, the Azores high-pressure centre is felt in August, and its clockwise movement brings in rains, which save the Douro port from the results of 'roasting' without moisture, as illustrated by the Tarragona port of similar latitudes on the summer-drought side of the peninsula.

Only Germany and Hungary are of much importance amongst the other wine-producing countries, though Greece is important as a currant-grower; and they both illustrate the value of high latitude and volcanic soil, e.g. at Tokay and Johannisberg. Indeed, the hock vineyards have a higher value[1] of output per acre than even the French vineyards; and the two special considerations are (*a*) the terracing of very steep slopes, e.g. of the volcanic Taunus, so as to give very sunny exposures, and (*b*) the amount of *dark* heat reflected off the lake-like expanses of the Rhine. The difference between a hock and a moselle depends on this, as does the excellence of the Swiss wines grown on the Alpine slopes which face the south-east of Lake Geneva.

[1] Total value in 1911 was £9,000,000.

The distribution of raw **silk** is almost entirely economic. No doubt, the white mulberry has a wider range than the silkworm, and, on the other hand, the typical Mediterranean summer is too dry to allow of more than one natural crop of of leaves, i.e. only one generation of silkworms. But the determining factor is labour. Not only must this be cheap, but it must also be characterized by delicate fingers, patience, assiduous carefulness—for the picking and cutting up of the leaves require almost as much skill as the handling of the silkworms. As the rush of work comes in the spring months, i.e. the precise time when other farm work is most pressing, male labour is practically not procurable; so that it becomes a question of female and child labour, which centres the industry on the densely peopled plain of Lombardy. Here too, as a matter of fact, there are the additional advantages of (*a*) showers almost throughout the year, (*b*) perfect shelter up under the Alps, and (*c*) external stimulus from France and Switzerland. These advantages are at a maximum in the Ticino valley, with its command of the great Alpine tunnels; but transport is a matter of minimum importance, silk being now sent even from Japan to Moscow via the Trans-Siberian Railway (at a cost of about £27 10*s.* per ton).

Somewhat similar considerations come into the distribution of **flax.** No doubt, the firm, moist, fibrous soil of the Po flood-plain is as favourable to the production of good flax[1] as the absolute summer-drought of the Neapolitan basin is to that of good linseed; but the fundamental considerations are a dense poverty-stricken population, and a standard of civilization so low that women are allowed, and even compelled, to do hard field-labour. In Russia labour is even cheaper than in Italy, and civilization is lower; but there is also a religious control, for a vegetable oil is demanded all over the country to take the place of animal fat during Advent and Lent. In Belgium, again, the controlling factors are really river-water so free from 'salts' as to be literally perfect for the cleansing of the fibre, and cheap labour with hereditary gifts for the work.

Industrial Map.

P. 21. Comparison of a Physical with a Geological map of Europe will show that between the great northern plain, with all its evidences of ancient glaciation, and the great Alpine uplift of Young Folded Mountains lies a belt of very hard old rock at intermediate levels. This is physically and economically the backbone of Europe; like other areas of hard old rock elsewhere, it is characteristically (*a*) rich in metal, especially along its lines of cleavage, i.e. its actual edge or scarp, and (*b*) related to beds of fuel, in various stages of development, in the younger strata which flank it. Industrial progress has been greatest where metals and true coal have been found side by side, especially if the area in question has also had easy access to the sea; and the importance is still further increased if the carboniferous basin happens also to be very fertile, as in the Rhine-land. Nor is this importance necessarily modern. The fertility always made

[1] Flax for seed is sown thinly (to encourage branching), but for fibre thickly (to make it 'leggy'). Cp. p. xvi.

for political importance in earlier ages, when 'Agriculture was King'; and, therefore, the modern industrial development found a population ready for it, and did not cause any dislocation of power such as occurred in England—except round Birmingham and Sheffield—at the time of the Industrial Revolution.

Agriculture is still essentially the most important occupation in Europe, with its fertility and variety of soils, its favourable and complementary climates, its easy access to markets, its dense population; but other industries are steadily robbing agriculture of its necessary labour, and forcing it to become more mechanical. Thus natural contrasts are exaggerated. For agriculture, in the widest sense, distributes, while industries concentrate; and pasture distributes more thinly than tillage, except where, as in Denmark, a dairy industry is definitely associated with tillage—when it is the best of all means of keeping population on the land. Again, the more advanced lands tend always to be more densely peopled than the more backward ones; so, coal and iron concentrate over areas, while other metals concentrate only in spots, and lines of movement have obvious advantages over less accessible places.

The differences in stage of development and in type of product should be related, historically as result, and economically as cause, to the double character of European commerce—as heavy water-traffic and fast land-traffic; but the Relief map shows that the relation of the great plain to the Alpine highland and the 'peak and pass' character of that highland put no serious obstacle to intercourse (*a*) with the ocean, or (*b*) between north and south. Further, the saving of distance by land over that by sea is so great in the east of the continent, e.g. *4,000 miles* between Riga and Odessa, that very bad service can still command traffic; but the case is different in the west, and so the area which has much the easier access both to the ocean and to the mineral bases of industry, has also much the better railway transport. Maximum industrial development, then, is north of 45° N. and west of 20° E.

British Isles.

P. 22. The economic importance of the British Isles rests largely on four features embodied in this map: (*a*) the narrowing of frontier eastward and southward which gave Dover its strategic importance, (*b*) the expansion westward over the Atlantic by routes which could not be stopped by war in earlier days, (*c*) the shallow seas which gave the basis of our great fishing industry, of our high tides, and of our freedom from cold Arctic currents, and (*d*) the relief which combined great variety in small area without undue complexity.

From a slaty nucleus which forms the base of all the four kingdoms round the Irish Sea, the land falls in belts towards the south-east. These lie more or less north-east and south-west, almost forming an epitome of geology; and they increase in fertility with ease of access to Europe, and in mineral wealth with ease of access to the Atlantic. Successive belts of clay, chalk, oolite, lias, sandstone, and marl form a great agricultural province, with its older outlets on the continental margins at London and Southampton and its younger outlets on the inner margin at Bristol and Hull. 'Behind' this belt lie the carboniferous limestone and millstone-grit, with natural outlets at the extreme ends in Cardiff and Newcastle; and to windward, i.e. rainward, of the coal, the great textile industries find their chief outlets through the Cheshire Gate by Liverpool and Manchester, while the opposite entrance to the Irish Sea is commanded by Glasgow and Belfast.

The basis of the industries illustrated on p. 25 is a belt of red sandstone, which is everywhere of great fertility, especially in Devonshire and Strathmore, and which is very rich in coal along the Severn, round the Pennines, and in Lowland Scotland; and, as this sandstone is also very rich in salt, especially in the basins of the Mersey and the Tees, and merges in ridges of limestone rich in iron and invaluable for flux in smelting, it has come to represent every important industry in the country.

P. 23. Climate. The area falls climatically into four provinces, but is everywhere wonderfully free from extremes. As the isotherms are 'sea-lines' in winter, running generally parallel to the ocean, and 'sun-lines' in summer, running generally parallel to the sun, the south-eastern quadrant has the greatest extremes, and is therefore most favourable to agriculture, especially for wheat. The north-eastern has a slightly smaller range (*c.* 20° F. *v.* 23° F.) because greater exposure to the ocean brings greater humidity; but, as it contains much fertile sandstone, it is still agricultural. The two western quadrants have least extremes of temperature because they have highest humidity, and this accounts for the excellence of their grass; and, as they have also very mild winters, they monopolize the great pastoral industry. As Ireland has not only a very small range (*c.* 16° F.), but also a much more favourable relief than Scotland, it stands far above the latter for cattle; and it falls behind Devonshire only in the inferior fertility of its limestone as contrasted with the red sandstone.

The rainfall is most evenly distributed, but is heavier during the winter half of the year and on the western half of the area; for the cyclonic storms, which are always working along the edge of the continental shelf in the north-west or up the English Channel, are more frequent then, because of the activity of the Icelandic centre of Low Pressure, and their cyclonic rains are intensified by the higher relief.

P. 24. Population. These maps, when compared with those of Relief and Vegetation (pp. 22 and 23), are seen to illustrate the principles underlying the distribution of population which have been laid down above. Mr. Mackinder's useful distinction between 'Metropolitan' and 'Industrial' England may, however, be pressed.

P. 25. Industries. The multiplication of centres in Industrial England, as against the single centre of Metropolitan England, is sufficient comment on the influence of the coalfields. Machinery is a late product, rising naturally in connexion with older industries, especially the textiles; and shipbuilding is almost entirely a matter of good labour, the steel plates now being worked cold and being delivered everywhere *at the same price*. The important thing is to

account for (*a*) their being made on the north-eastern coalfield, and (*b*) the presence of great metal industries far inland. The former depends entirely on the Durham coke, which is large enough not to choke the furnaces and strong enough to bear a great weight of ore: the latter is largely due to the early start of the industry in the particular place.

For the metal industry of Sheffield and Birmingham had its historic foundations in the local supplies of iron and of charcoal—from the Sherwood and Arden forests. Sheffield had the further advantages of the Sheaf water-power, fine crucible clay, and the millstone-grit which determined its specialization in cutlery, while the navigable Don—which now enables it to compete even with coastal towns in the manufacture of, e.g. heavy armour-plates—enabled it centuries ago to import the fine Swedish metal. This is still used in the cutlery industry, but Spanish and Furness metal is used in the heavy work.

Birmingham, though at about equal distances from navigable water on Trent and Severn and Avon, had practically to wait for railways before it was able to develop fully; but it was an important road-junction in quite early times—on the edge of the great wooded meadowlands, with a busy leather industry and fine sand for castings, the bases of its old harness industry. But under these conditions industries developed naturally in two directions—(*a*) transport, e.g. from bicycles to rolling-stock, and (*b*) lines where a maximum amount of labour was spent on a minimum amount of raw material, e.g. pins, pens, screws, &c. It is almost true to say that in most of the industries 'the raw metal might be taxed up to 50 per cent. of its market price without appreciably raising the price of the finished article'.

The distribution of textiles is, for the most part, quite normal, being associated with densely peopled coalfields with easy access—climatic and commercial—to the ocean; but there is at least one exceptional distribution, i.e. that of the Scotch tweeds. The original staple was wool all over the country, associated specially with the rearing of sheep on the drier, short-turfed chalk and limestone uplands in the eastern and southern parts of Great Britain, e.g. round the old Abbeys of Yorkshire and Somersetshire—though the Cotswold wool was never very fine. As the coalfields were developed, and the supply of home wool became insufficient, only those old centres were usually able to maintain their position which were near both coal and sea-transport; and so, e.g. Norwich fell out of the race. Climate and access to good water were more favourable in the Tweed basin, and the industry has survived, but under difficulties; for the original causes have ceased to operate, and have been replaced by the advantages of momentum, inertia, and ease of credit enjoyed by a famous old centre of industry. The geographic difficulties are the inland position, the inadequate home supply of wool, and the absence of other industries such as the mining and engineering of Yorkshire.

The mills are so far inland that the foreign supplies must come by rail, and it is cheapest to bring them direct from the great market in London; but, as London is also the great market for tweeds, the manufactured product has to go back there—again by rail. Then the work is more suited to women and girls than to men, but there are no 'outside' industries to absorb the men—a main cause of the difficulty in drawing population to the area; wages, therefore—for strictly comparable work—are often 50 per cent. higher than in Yorkshire. Lastly, though the hard old rock produces very fine wool and the purest and softest of water, it is too old to contain coal, so that all fuel has to be imported,—the water-power, which was quite sufficient for the small (carding and spinning) mills of olden days, being now quite insufficient for the heavy looms.

The centralization of the cotton industry on the ring of torrent-scarred hills in the humid air behind Manchester is essentially climatic, as that of fine linen is round Belfast.

Silk, as an animal fibre, is more suited to the drier air in the lee of the Welsh and Pennines hills; and its extension towards the cotton area was based partly on the use of cotton warp in the weaving of spun-silk, itself the result of the eighteenth-century spinners using 'cotton' machinery and 'cotton' methods, e.g. cutting the long silk fibres down to the length of cotton fibres. The felt industry of the Rossendale Valley occupies a similar transition area between the cotton and the wool. It was the 'heavy linens' of Dundee, based on proximity to the Baltic, that made the place suitable for similar operations in the jute industry.

In all this textile work the high quality is of supreme importance, even British silks being unsurpassed either for texture or for price; and the superiority is specially marked in the cotton fabrics, as is well illustrated by the following statistics of bales per 1,000 spindles (1911):

Great Britain, *c.* 70; U.S.A., *c.* 160; Japan, *c.* 700.

Lancashire alone used 40,000,000 bales of cotton under these conditions, 10,000,000 being Egyptian, with a quite common output of *100 miles of yarn* from 1 lb. of cotton.

The silica base of the glass industries is, of course, very widely distributed, generally in the form of pure sand; and the best sands are found along the south coast, e.g. near Hastings and in the Isle of Wight. But the special need for very high temperature and suitable fuel—not to mention soda—concentrates the industry on the coalfields, e.g. at Newcastle and St. Helens, Birmingham and Bristol, especially the former pair. As the brittleness of the product complicates transport, density of population encourages the industry even in the absence of fuel; for instance, the industry is in many ways as important in London as in West Yorkshire, but it may be considered there as a definite annex to the chemical industry.

As earthenware is based only on the baking of clay, not on the melting of sand, it is not so much tied to the coalfields or to the factory system. Most of the materials, too, except the kaolin, are fairly common; and, as the processes are simpler than in the glass industry, it is an older industry. The Staffordshire 'Potteries' had the original advantage of a fairly dense population and an abundance of various kinds of clay; and the local supplies of coal enabled the industry to be kept *in loco* when kaolin had to be imported for the porcelain branch of the industry. As climatic conditions

are most favourable to the decomposition of felspar in the Cornish peninsula. Dartmoor is the great source of kaolin. As sulphuric acid is ultimately dependent on import (of sulphur, copper, &c.), and as soda ash is based on common salt, the chemical industries are situated mainly on the two coalfields that are flanked by salt and near the sea, i.e. those of 'Lancashire' and 'Durham'; but the great copper-smelting area of South Wales is obviously very important.

Central Europe.—Orographical.

Pp. 26, 27. This map illustrates (*a*) the facilities for communication both by land and by sea offered by the distribution of relief, and (*b*) the variety of relief within such a small area: and the latter is a great impulse to economic development, because each unit of relief may be expected to produce its own natural products—plants and animals, beasts and men. Further, the juxtaposition of these relief units is emphasized by the juxtaposition of the two climatic units of summer-drought and summer-rain, the one an area of continental lowland and the other a series of peninsular highlands.

The map shows that it is possible to travel from Bayonne to Königsberg without ever being 600 feet above the sea; and this not only greatly facilitates railway and canal and river transport, but makes it impossible to compare continental with English canal-systems or methods. In the 230 miles between Berlin and Hamburg there are *three* locks, while the average in England is *one lock every 2,100 yards!* It should be noticed, however, that wherever growing population increases the demand for water, the cost of canals is increasing, while economically they are losing ground—being cumbrous, immobile (especially for terminal and siding accommodation), slow, unpunctual, &c. Indeed, their real utility is largely limited to (*a*) linking navigable rivers, e.g. in France and Germany, both of which have at least 5,000 miles of navigable river, and (*b*) making 'arms of the sea', as the Kiel and the Manchester ship-canals.

Most of the area coloured greyish-green (500–1,000 feet) consists of the belt of old crystalline cores, or peneplains, the scarp of which is as rich in metals as the rock itself is poor in organic materials; and where this belt is nearest geographically to rock of the nearest geological age, fuels and salt are often found in close proximity to the metals, e.g. at Nancy and Stassfurt, St. Etienne and Liège. Cf. p. xvii.

Southern Europe.—Commercial.

Pp. 28, 29. The Mediterranean route serves both the largest mass of land in the world and the densest mass of people; and the Mediterranean basin is a distinct natural region, between the Alps and the Sahara, and with the great economic advantage of being not only four times as long as it is wide, but also studded with islands—the sailor's landmarks of early days. In many respects the most important is one of the smallest, Malta, on the saddle between the two great basins—the north-western basin being essentially an importer of food, while the south-eastern is essentially an exporter of food, especially from its Black Sea 'pocket'; in each case the activity should be connected with greater articulation of coast and better economic conditions on the European than on the non-European sides.

The geographic background of this has a double importance. The variable winds of the Mediterranean itself and the dangerous navigation of the Red Sea would always have prevented sailing-ships from making the route a thoroughfare between the Indian Ocean and the Atlantic; and, on the other hand, coal is always relatively cheap—no matter what the distance from the coalfield—where there is a certainty of heavy return cargoes. The Suez route is essentially a coastal route, fed from a succession of great bays on the European side, each capable of supplying unfailing cargoes, e.g. at Barcelona and Marseilles or Naples and Constantinople. No port on the African coast of the route except Alexandria has a local hinterland capable of guaranteeing a full return-cargo for a tramp collier, and only Port Said has a non-local hinterland capable of doing so—the main reason for its having become the most important coaling-station for tramps in the whole Mediterranean.

The importance of Gibraltar depends on relief and climate as well as on position. For the rock is a typical piece of sierra, exceedingly steep on all sides except the west, so that the natural site for a town was facing the large and safe Bay of Algeciras; and, as the sierra runs at right angles to the wet wind, the rainfall is sufficient to provide—with reasonable care—drinking-water for the whole community, in spite of the small area (3 miles × ½ mile).

The hilly peninsula which divides the Golden Horn from the Sea of Marmora, with its background of swamp, gave Constantinople a position not unlike that of Gibraltar; but the former has been a great land and sea junction for 2,000 years, during the first 1,000 of which Gibraltar was little more than a terminus.

The best channel through the Lido incomplete storm-beach was always the one in the lee of the rialto ('high bank') which has now been deepened to 30 feet; and its palmy days were when this natural refuge was on the main route between the East and the Alpine passes; but the position is now much less important than one where a fertile and densely populated part of the mainland faces on to the deep waters of an open sea, as at Naples.

Eurasian Trade-Routes.

Pp. 30, 30A. These maps illustrate the permanence of geographic control, even though its manifestation changes; for traffic will always seek the line of least *ultimate* resistance, and the Suez Isthmus has always been such a line between East and West.

At first the greater dangers of the more articulate European coast of the Mediterranean, and the more continuous landmarks of the even non-European coast, gave the latter the advantage. Traffic not only moved essentially east-and-west, but was purely coastal and coastwise; Carthage, therefore, was a natural focus, and the feeders of the main route (between Damascus, via Tyre and Sidon, and Gades) were mainly cross-desert routes. When north-and-south movement followed, it was still coastal and coastwise, though

reaching all parts of the Mediterranean basin, as in the Genoese settlement at Kaffa (Theodosia) and the Venetian settlement at Tana (Azov). The development of Continental traffic out of the original traffic was based on the harbours of Marseilles, Venice, and Constantinople, and intimately associated with the valleys of Rhone, Rhine, and Danube; and important centres sprang up at Vienna, Ratisbon and Nürnberg, Basel and Frankfort. Inter-continental development was, of course, focused in and round Asia Minor, Tadmor and Mesul being the great junctions and Basra the pivot; and Trebizond and Sinope, Seleucia and Tripolis, became important termini.

Cross-desert traffic had, of course, been done by camel: but to-day a single 1,000-ton steamer can ship the loads of 5,000 camels, and this is only the climax of what was begun with the discovery of the sea-route to India. In the same way, the Trans-Siberian and Trans-Caspian railways represent the ancient routes of Asiatic raiders through the Ural-Caspian Gate and across the Bosphorus.

Primitive man—always very much at the mercy of his environment—was entirely controlled in his wider movements by the physical features of the regions passed through, partly because of his ingrained *fear of being lost* if he got out of sight of great landmarks; but modern engineers seek only the line of ultimate least resistance, an Alpine uplift of 10,000 feet of crystalline rock—which can be bored for a tunnel—being a much less formidable obstacle ultimately than the scarp of a 2,000-foot plateau—which has to be climbed. These essential conditions are well illustrated by the map on p. 30, when compared with the Physical and Vegetation maps. For instance, the Trans-Caspian route crosses the Caspian in its narrowest part near Krasnovodsk (Usun Ada); it hugs the watershed of the Iranian scarp (Kopet Dagh); it dare not cross the desert farther north than Merv, where evaporation and absorption give a premature end to the Murghab and the Hari Rud. So the Turkistan branch skirts the margin of the Kizil Kum ('Red Sands') as marked by the Syr Daria, round the western edge of the great central plateau, while the Trans-Siberian line skirts its northern edge. The Turkistan and Trans-Caspian lines have their natural continuation respectively between Peshawar and Calcutta and between Quetta and Madras, while the Chinese lines are skirting the Monsoon edge of the plateau. Windward of this Monsoon edge live half the people in the world.

This is the key to the transport problems of Asia, as the continent of enormous distances, complicated by the presence of vast deserts and gigantic mountains and by the absence of great rivers in the interior. The total distance from St. Petersburg to Vladivostok by the Trans-Siberian Railway is about 5,500 miles—fully 30 of which are over bridges; and the distance to Pekin by the same line is about 6,000 miles, i.e. *less* than that from London to Bombay via Suez.

There is a contract for the carrying of the Indian mails from England, which is most important in relation to the prosperity of our Mercantile Marine; and the transference of the mails to a railway, e.g. the Baghdad line, would be a mistake, even if the line were our own. In any case, the railway could not deliver the mails any quicker than the P. & O. boats can, or could, and would carry them through areas both in Europe and in Asia which cannot compare with West Europe in, e.g. security for life and property; and the cost by land would be enormously greater.

Reference to the Population map on p. 33 shows, too, that there is practically no immediate probability of such a line being financially successful. Even in Anatolia it runs through an area where the average population does not exceed fifteen per square mile; and over two-thirds of the rest of the route to Baghdad it would run through areas where the average does not exceed five per square mile. On the other hand, there were several reasons for extending the Adana line across the rich cotton-growing plain of Cilicia to Osmanieh, and even to the Euphrates, with branches to Aleppo and over the rich orange-growing plain of Issus to Alexandretta, and irrigation is already beginning to revolutionize Mesopotamia—e.g. by removing the causes of (*a*) the permanent swamps south of Baghdad (cf. the 'Sea' of Nedjet) and (*b*) the periodic devastating floods.

At the same time, the 'Baghdad Railway' is making steady progress. The 50 odd miles across the Taurus between Karapunar and Dorak, with its dozen tunnels and the gorges of the Chakut river, are proving a very tedious and costly task: but the northern section is working right up to Karapunar, and a branch line has been made in the south to the Mersina-Tarsus-Adana line, which—like the Anatolian line (Haidar Pasha to Konia)—has been incorporated with the main Baghdad line. The completion of the tunnels through the Amanus between Osmanieh and Ragun makes Muslimieh (i.e. practically Aleppo) an important junction, and gives the Euphrates traffic from Jerablus the choice of termini at Alexandretta and Mersina or at Tripoli and Beirut. The railway journey even from Beirut to Jerablus takes only two days, and the Euphrates steamer takes about six days from Jerablus to Feluja (for Baghdad).

It is very important to notice, however, that the centre of economic gravity is already on the 'Panama' coast of the continent. For it was 'Pacific' isolation that led, literally some thousands of years ago, to the trend of caravan movement *westward* from the Monsoon lands; and, as these caravans have always carried only goods of high value and small bulk, so does and must the Trans-Siberian railway, e.g. tea and silk. For all other goods the line is *too long* for it to be a trans-continental carrier, though it is already an important carrier, e.g. of grain and butter, from *Western* Siberia. In the same way, the conversion of the old Syr-valley caravan-route into the Turkistan railway has already enabled Turkistan to supply two-fifths of the Russian demand for raw cotton.

But, with the centre of economic gravity in the Monsoon region, the problem has to be restated in the terms of rail-transport; for the Trans-Siberian line is easily fed only by the Siberian rivers in summer and by sledge traffic in winter, while the projected railway from Calcutta to Canton via the Sadiya coalfield and through the vast wealth of Yunnan—with a saving of nearly 2,500 miles, compared with the 4,000-mile sea-route via Singapore—will eventually more than compensate the East for the speedier completion of the

Baghdad line, whether its ultimate terminus proves to be at Alexandretta or at the German foothold of Haidar. It seems probable, therefore, that the Temperate Monsoon area will outpace the 'Tropical' Hindo-Gangetic plain, and that the Chicago of Asia will be the triple-city of Hankau. If so, Hong-Kong may become the greatest port in Asia.

The Indian Ocean.

Pp. 30[B].–30[C]. Commercially, if not climatically, the Indian Ocean is simply a gigantic bay, with a typical hinterland of ancient plateau. On three sides the plateau only flanks the ocean, and in the south scarcely does even this: but in the north it intrudes so much that it has always given India the domination of the basin. For several reasons, however, this domination has been mainly indirect—through Arab and 'Chinese' navigators. For the Monsoon regime is most favourable to long, 'out-and-home,' seasonal voyages from the sides, especially the west side, of the basin to its centre. As long as the wind blows towards India, the precious rains concentrate attention on agriculture: India, as far the most fertile of the lands in the basin, was practically self-contained, except for metals; and, though her inland navigation is unique inside the whole basin, her coasts and currents are very dangerous to traffic in the 'Home' waters; above all things, she was always far too much absorbed in internal strife to become a great Sea-power.

Both the domination of India and the direction of traffic are reflected in modern times, for it is specially round the Indian Ocean that Bombay cotton-goods and Bengal rice find their regular markets; but the ocean is now only a section of the great 'Suez' route, and the coaling-stations of Colombo and Singapore have largely replaced Batavia and Mauritius, and entirely ousted Ormuz and Goa. In the immediate future the trade of the basin may be adversely affected by the Panama Canal, but the effect will be practically confined to goods in transit for the Pacific, and may be compensated by new American traffic from the Pacific. In the west, subsidised lines—German along the African coast and French in the islands—greatly facilitate traffic, which has always been assisted by the currents, the Mozambique current having flanking 'back-drifts' which move in the opposite direction.

The four ports selected for illustration represent very distinct types. Aden, though 100 miles east of the narrow 12-mile strait of Bab-el-Mandeb, is the real key to the Red Sea; and it has been for several thousand years a great port of exchange between north and south as well as between east and west. But, with no products of its own, it has to pay highly for its coal; and, therefore, it is usually patronized only by mail vessels and in circumstances where expense is ignored. Except that it is a fragment of an extinct volcano, it resembles Gibraltar greatly both in position and in physique.

Singapore, though far from being desert, has no important products of its own; but it commands the whole traffic between the China Sea and the Bay of Bengal, being 500 miles farther north than Batavia. As the gateway between the two areas, it has become the junction of all the chief routes between the Indian and Pacific oceans, as well as the local centre of the Malay area; and it is a meeting-place not only of great trade-routes, but of three great racial elements—Chinese, Malay, and Indian. With easy access to, e.g. Rangoon rice and Batavian sugar, for heavy cargoes outwards, it commands cheap coal inwards; so its fine commercial and strategic position is emphasized by the facilities for coaling. Cf. p. xx.

The position of Zanzibar is different again. The whole of tropical Africa, except for a narrow belt along the coasts—rather broader in the east than in the west—is commercially undeveloped; and it can only be developed from the coast under European influences. This has led to a reconstruction of old caravan routes, which in the east largely converged on the rich spice-island of Zanzibar at the limit of the great monsoon path and with its commerce in 'Indian' hands. With modern sanitation, Dar es Salaam and Mombasa may deprive Zanzibar of its old advantage over all places on the malarial coast of the continent, and the new railways are certainly damaging its trade; but in stormy weather its port, on the sheltered western side of the island, is much the best along the whole coast.

Like Singapore, Fremantle is quite a modern development; but, unlike Singapore, it is purely artificial. Its existence depends on two facts: half the population of the state is—orginally all of it was—concentrated in a narrow belt between Geraldton and Albany; and Perth, the natural centre of this belt and on its chief river, lies some miles up that river. Of course, the interior is very rich in gold and other metals; but all the gold that has ever been found there could be carried by a single steamer, and Albany is not only a much finer harbour, but also more on the direct routes.

Egyptian Maps.

P. 30[D]. The Suez Canal has the great advantage over the Panama Canal of being all at sea-level, the tide from the south being lost in the Bitter Lakes. It saves from 4,500 to 5,000 miles to India, 3,500 to China, and nominally 1,000 to Melbourne; but P. and O. boats calling at Marseilles save only 300 miles to Melbourne, and the Orient boats calling at Toulon and Naples do not save so much. On the other hand, the Cape route has greatly inferior coaling facilities, the longest run on the Suez route being not much more than 3,000 miles (Colombo to Fremantle), while that from Cape Town to Albany is about 5,000; and the paucity of good harbours almost corresponds to the restrictions of draught on the canal.

The maximum draught now is 30 feet, i.e. about 6 feet more than in 1870; and not 2 per cent. of the vessels using the canal draw that maximum, nor do the Eastern harbours themselves supply more. At Calcutta the depth is only 29 feet; and it is said that, with the exception of Sydney, no Eastern port at low tide has a greater depth than the canal has throughout its 100 odd miles. There is, however, no great difficulty in increasing the depth of the canal except for the sand in the northern section,—driven into the

Port Said entrance by the January and February storms on the Levant. Of course, with very light and uncertain winds on the Red Sea and the Levant, sailing-vessels do not use the canal; but, with cheap coal at both ends of the 'Suez Route' and with abundance of heavy cargoes 'out' to attract cheap coal 'in' *en route*, it is almost ideal for steamers. Indeed, it was the canal that made it possible, because profitable, for steamers to come into the 'Suez' trade; and the mass of the present traffic is entirely created by them. The original belief, however, was that steamers could not *afford* to take very long voyages, and the canal was designed only for sailing ships!

The local importance of the canal—other than strategic—centres at Ismailiya, on the route of the ancient Egyptian canal to the Nile; for the ancient waterway was restored and extended to supply fresh water to the army of native labourers engaged on the cutting of the canal, and it has been utilized also for local traffic and for irrigation. Local importance may also come to be attached to the oil-deposits along the Anglo-Egyptian shore of the Jobal Strait, especially if a refinery is established at Suez; and this has, of course, a strategic as well as a commercial importance, especial to Britain.

The total area of Egypt between Wady Halfa and the Mediterranean is *c.* 400,000 square miles, but the Egypt of 'cultivation' is a long strip of oasis not aggregating more than 14,000 square miles, i. e. about the size of Holland. Aswan is, of course, as the First Cataract, the site of the great dam (capable of storing over a billion tons of water), which is supplemented by the barrage at Esna; and there are barrages at Asyut, near Cairo, and at Zifta. The monsoon flood is at its mean maximum of 24½ feet at Aswan about the second week of September; and the natural cultivation has always been of winter crops, such as wheat and barley, sown when the flood retreated. Modern crops, such as sugar and cotton, are sown in the spring and reaped in the autumn, and so depend absolutely on the storage of water; but, as the stored water deposits its silt in the reservoirs, the fertility of the soil is not maintained quite as it used to be. At present the only large areas where perennial water can be easily obtained are the delta and the Fayyum,—cotton being watered (in the delta) every three weeks from mid-March to mid-August, and sugar cane (in Upper Egypt) every two weeks.

Between the self-raised banks of the Nile and the bordering hills there are, obviously, depressions, and across these dykes have been built; these shut in the 'basins' of Upper Egypt, where the flood lies for six or seven weeks, both watering and depositing its precious silt. Lower Egypt has been controlled entirely by the Great Barrage across the bifurcated river, i. e. at the apex of the delta, below Cairo. Between Cairo and Asyut summer irrigation was being given to the higher lands even before the beginning of this century. The maize or millet of the flood (July–November) and the wheat, barley, beans, &c., of the winter (December–March) seasons do little more than support the country; the summer crops (cotton, sugar, rice) are the great asset, and their extension depends on further replacing of basin by perennial irrigation. But the storage capacity of the reservoirs is already practically at a maximum, and the entire suppresion of basins might not be an unmixed advantage, e. g. in the matter of drainage—very important in the case of a long-rooted plant like cotton. Since the Aswan dam was finished, the greater part of Middle Egypt has been converted from 'basin' to 'perennial' supply; and the basin irrigation has been greatly improved by the reduction of the area to be served and by the construction of the barrages at Esna and Asyut. Indeed, the pressing problems now are those of drainage and reclamation; and the difficulty is to hit the mean between the equally pressing needs of all the deltaic lands—abundance of flood-water and efficient drainage. As the basin areas are converted, sugar gives place to cotton; and the latter occupies the land a shorter time, and gives a larger profit. In the canalized areas now *c.* 40 per cent. of the total cultivated area is always under cotton, and the rotation has been shortened from three to two years; but this is causing deterioration of (*a*) the soil, and (*b*) the cotton crop, as well as encroaching upon the land available for food-crops.

The average production of cotton is about 125 lb. per acre, over an area of *c.* 1,500,000 acres; and, as with other 'Irrigation' cottons, the fibre has a natural twist which is of great value in spinning thread and for mixing with, i. e. adulterating, a normally twisted fibre such as wool. Its value for mercerizing may possibly be due not only to its long staple but also to the luminous quality of the air, owing to the great evaporation off the broad river in the narrow white-walled valley; and, if so, that would account for the less favourable results from irrigation cottons grown in a harder air, e. g. Sind.

Now that Egypt is provided with reservoirs to meet all present local needs, there is no reason why the upper reaches of the Nile should not be used for the Sudan, e. g. in the provinces of Berber and Khartum. Between Zeidah and Khartum fully 120,000 acres of exceedingly suitable land could easily be put under cotton (rotating with wheat and green crops) by pumping water directly from the Nile, while the Sennar barrage and canals will supply the Gezira plain. This, like the low riverine lands above Zeidah, produces cotton at least equal to that of the delta. Even in 1913 the largest export from the Egyptian Sudan except gum was ginned cotton.

Asia: Economic Map.

P. 31. Reference to the Climatic and Population maps of pp. 32 and 33 (which logically precede this) illustrates the hardiness of the **tea**-plant and its relation to (*a*) damp heat, (*b*) dense population, (*c*) highland relief. Cf. pp. xxv and lii.

Similarly, the distribution of **coffee** illustrates (*a*) its sensitiveness to frost, (*b*) its need of high humidity—supplied in Arabia by thick mists off the sea during the hotter hours of every day, (*c*) its relation to highland relief, (*d*) the nearness to the ocean which is typical of a crop grown solely for export. Cf. p. liii.

The distribution of **rice** illustrates its relation (*a*) to wet summers, (*b*) to a monsoonal régime, which compels fore-

thought and such industry as is peculiarly needed for rice-culture, and (*c*) to coastal sites—a main cause for the incorrect belief (amongst people who reached Monsoon Asia by sea) that it is the main food of the whole Monsoon area. It is the staple food of perhaps one-third of the world, and that third is concentrated in south-eastern Asia; and fully 90 per cent. of the exports of rice come from the same area. But it is not the main food inland. Cf. p. li.

The distribution of **opium** has now more a political and historic than an economic interest, for recent arrangements between India and China are leading to very widespread changes, large areas of good land being now freed for cultivation under cotton or sugar or other plants; and the fact that the wide use of opium sprang up amongst rice-growers (to soothe their rheumatic pains) suggests the adaptation of the land for, e. g. the soya bean.

The distribution of **silk** should be carefully related to climate, population, and transport; and it will be inferred—(*a*) that in parts of China and Japan the worms have to be kept in heated rooms, and must feed on other than white-mulberry leaves, the change of food causing a change in the natural colour of the silk; (*b*) that the opening up of these two countries must continue to affect European silk-rearers, as it has done in recent years; and (*c*) that an article of such high value in very small bulk and weight must be of supreme economic importance in a rugged and almost inaccessible highland like that of northern Hondo. Cf. pp. xvii and lxii.

Owing partly to great reductions in the cost of working **gold** in more accessible places, and partly to the insufficient supply of labour in Siberia, Russia does not hold a place in the gold-mining industry at all commensurate with her known, still less with her probable, supplies of the metal.

The whole of the **fishery** round the Sea of Japan is really Japanese; it is founded no doubt on the island-environment, and supported by an extraordinary wealth of fish. But there are two important influences at work in the need for animal food and the need for manure; for Japan is poorly provided with domestic animals—fish being the staple animal food of its 50,000,000 inhabitants, and its soil is very far from rich.

Cattle in the Russian Empire and in India are essentially poor, and kept largely for draught purposes, especially in India; but while in India they are found in the ratios of 62 to the square mile and 36 per 100 persons, in Asiatic Russia the ratios are only 2 to the square mile, and 33 per 100 persons. Indeed, India contains one-third of all the cattle in the world—having 113,000,000 against the 60,000,000 of U.S.A., which stands second; but except for the hides they are of merely local importance (e.g. milk and labour). Siberia, on the contrary, is already an important exporter of butter, having exported in 1913 about *66,000 tons* of butter—mainly from Barnaul and Omsk, almost entirely between April and October, and specially destined for Windau—climatically, the most favoured port in northern Russia; and, with the spread of alfalfa in the irrigation areas of Asiatic Russia, the dairy industry is bound to spread.

South-East Asia possesses, in the **teak,** the most valuable timber-tree in the world. The tree needs good drainage, heavy seasonal rains, and an average temperature of 75° F. without great range; and it is, therefore, exactly suited to tropical Burma and to Siam—growing up the mountain-sides to a height of 3,000 feet and dropping its leaves in the dry season. Only elephants can work the timber in the deep mud of the rainy season, i. e. the only time when the ground is soft enough for the felling: and, as the wood will only float when properly seasoned, and not too well even then, a turbulent river like the Mekong is practically useless.

Physical and Economic Maps.

Pp. 32 and 33. The Orographic map does suggest (*a*) the complete dissociation of peninsular from lowland Asia, and (*b*) the continuity of that lowland, with its influence on railway construction (around the great plateau) and on the navigability of the Obi and Yenisei; but it is on too small a scale to emphasize the huge obstacle presented by the high and steep scarps of the plateau—which often ascend above the normal level in marginal ranges. This, of course, has a climatic as well as a commercial significance—cf. the drought of the Tarim basin and the difficulty of the Cilician Gates.

On the lowland the position of the 600-foot contour should be related to the extraordinary length of the lower courses of the rivers in contrast with their very short upper courses; and the 3,000-foot line should be considered the limit of the 'lowlands'. The 6,000-foot line emphasizes the limits of the plateau core, while the 12,000-foot line marks the minimum level of the Tibetan plateau.

Climatically, the northern lowland admits cyclonic storms from the Atlantic and the Mediterranean to the head waters of the Yenisei and the Amu, and 'monsoonal' rains from the Arctic Ocean in summer. In midwinter, when the frozen Arctic acts as land, the temperature registered at the Pole of Cold in the 'pit' of Verkhoyansk has fallen to −93° F., i. e. fully 125 degrees of frost; and, with a vast area in the east of the Shamo basin having a (sea-level) pressure of 30·5 inches at the same time, there are 'monsoonal' winds out in all directions, e. g. N.W. winds gravitating to Japan.

The slightly abnormal (northward) position of this great belt of high pressure and its 'pear' shape (with the stalk pointing northward) reflect the northward slope of the great Tibetan plateau (with an actual pressure of under 15) and the continental influence of the frozen Arctic as focused in the Pole of Cold. The influence of the monsoonal outflow is reflected in the winter rainfall on the southern shores of the Japanese and Chinese seas and in Annam. In summer the pressure is just as abnormally low (compared with that over other continents) as it is abnormally high in winter; for a large area, including practically all Mesopotamia and Hindustan, has a pressure of under 29·5, while the whole area between L. Baikal and the Gulf of Oman has not over 29·6! This is of supreme importance in the monsoon regions; for the wet monsoon cannot 'burst' into India until the whole of the surrounding plateau has warmed up to a minimum low pressure.

The Temperature map for July reflects (*a*) the influence of the monsoon humidity in lowering temperature, India having its maximum under the clear skies and dry air of May, and (*b*) the influence of the cold waters of the Okhotsk Sea and the Arctic current in producing mist; but, of course, it needs to be checked by the Orographical map for actual temperature and for actual pressure.

The broad generalizations of the Vegetation map, just because they are broad, make the best base for the Population map; but they contain some significant suggestions of their own. For instance, comparison with the Temperature maps shows that the winter Pole of Cold falls in summer within isotherm 50° F., and therefore within the limits of the Siberian forest. This shows how indifferent conifers are to cold, provided it is not accompanied—as it is on the steppes—by wind; and, of course, in the eye of a high-pressure focus, wind is impossible. The distribution of desert is equally significant, but comparison is needed with a large-scale Orographical map; for normal level may be almost as important as marginal heights or other obstacles to wet winds. For instance, the Turfan oasis is not only in the Tarim *Basin*, but also itself below sea-level; and the winter temperature varies every day 50° F. between sunrise and midday. Again, comparison with the Rainfall maps would suggest reasons for the Siberian wheat and dairy trades, but scarcely for the wide expanse of täiga, or forest; and here the important point is the snow, which not only protects in winter, but is also more valuable than an equal amount of rain in spring. The snow, too, was as vital a factor in the ease with which the Russians overran Siberia by sledge, as the sea was in the British conquest of India.

Comparison of the Political map with the maps on p. 13 suggests one of the most interesting political problems: the future of Asia. In the north—speaking very broadly—the White man is ruling the Yellow man in a purely continental climate by means of land mobility—epitomized in the Trans-Siberian Railway. In the south the White man is ruling the White man—though a deeply sunburnt White man—in virtue of sea mobility, focused on the Suez Canal. In the West the Yellow man, from a buffer position between the marine and the continental empires, is ruling the White man, with all the difficulties inherent in a buffer position. Will the Yellow man on the eastern margin, in virtue of his marine power, dominate the continental Yellow man of the mainland?

India: Economic.

P. 34. India under British rule gives an interesting illustration of the strong contrast between the Oriental interest in an intellectual conclusion and the Occidental craving for a practical result; and the present economic conditions are largely due to the refusal to accept the environment as we found it, the great revolutions having been, or being, effected by irrigation and railways.[1] In this connexion tea is a very typical 'British' crop.

India illustrates well all the essential conditions referred to on p. xxiii, and now claims all the most valuable varieties of the **tea**-plant. Much the largest area (*c.* 355,000 acres) under tea is in Assam, in the Brahmaputra and Barak valleys, especially in the Surma (Cachar and Sylhet) part of the Barak basin; and Bengal comes second, with almost half as much acreage, divided between the extreme south-east (Chittagong) and the extreme north-west (Darjeeling and Jalpaiguri). These two places, though only 50 miles apart and with practically the same rainfall (120″), have a difference of 7,000 feet in altitude, and this is reflected in the difference of yield per acre—the lowland giving nearly 600 lb. against 300 lb. on the highland. There is a somewhat similarly great difference in flavour—in favour of the highland tea; and this is repeated, not only in the Dehra Dun and Kangra gardens of the United Provinces and the Punjab, but even in the east, where Upper Assam and Cachar are much ahead of Sylhet and Chittagong. In these highland areas the cold season (41° F. at Darjeeling) is a real 'winter', and the short summer limits both the amount and the duration of 'flushing'; but in the hot steamy areas of small temperature-range, especially in Ceylon, picking can go on the whole year through, some gardens in Ceylon giving a total of 1,300 or 1,400 lb. The great need for a relatively high humidity during the dry season is similarly favourable to the Nilghiri and Travancore gardens, where—over an acreage of respectively 21,000 and 32,000—there is a yield of nearly 400 and nearly 600 lb., the latter being partly a result of the very high standard of education in Travancore. In all the districts except Assam, where, too, the gardens are very large (300–400 acres), there is a dense population (at least 200 per square mile).

India has altogether under **wheat** (cf. p. xlix) an area as large as Ireland, but it is very unequally divided, more than three-quarters being a 'northern' crop. Everywhere, of course, it is a winter crop; and in all the central area it is grown mainly in the deep moisture-holding 'black' soil, without manure and without irrigation. On the alluvial loams of the 'north', however, with canal and well irrigation, the yield is practically double that of the central areas (not 10 bushels per acre). Though the total crop may reach 360,000,000 bushels, the average yield per acre is very low (11 bushels); and fully two-thirds is consumed in India except in years when the rice and millet harvests are very good, while in 'bad' years there is practically none for export. During the past thirty years the export has only risen some 100,000 tons, mainly owing to the precarious cultivation; but both quality and quantity are now being improved, e.g. by the breaking up of the stubble directly after the harvest instead of leaving it to 'bake' during the dry hot season.

The total area under **rice** (cf. p. xxiii) is nearly as large as the British Isles, but considerably more than half is in the two provinces of Bengal and Bihar-and-Orissa, where there are two main crops, an early crop, sown on the higher lands under the spring rains (cf. p. xxvii), and a late crop, sown on the lower lands during the normal wet monsoon. On the

[1] Since the map was printed, the Indo-Ceylon railway (bridge and ferry) route has been completed.

irrigated deltas of Madras, to which rich silt is carried from the basalt watershed, and where the dominant rains come in winter, three crops are often raised; but elsewhere a single crop of rice is followed by a crop of gram or other pulse. The great export (75 per cent.) is from Burma, where five-sevenths of the cultivated land is under rice. It is the staple food of the people, and three-fifths of the crop is consumed on the spot; but the population is not dense (50–100 per square mile), so that over 60 per cent. of the Western demands is supplied from Burma. There are, however, two difficulties: owing to the rush of work with the limited labour, much of the rice is broken—careless mixture of different kinds leading to the breakage of the largest, i.e. best, grains; and, owing to absence both of proper rotation and of cattle-keeping in Lower Burma, the maintenance of output will depend on the better methods in Upper Burma, i.e. the area farthest from markets.

The **opium** areas are now rather of historic than economic importance, though the 'Bengal' area alone has reached 1,000 square miles, while the total 'Malwa' area is even larger. In both cases the land withdrawn from opium will probably, as the map suggests, be put under tobacco: and the Malwa tobacco is already somewhat famous.

Like the tea, **tobacco** belongs to horticulture or intensive agriculture; and its great demand for cheap labour can be supplied partly by women and children. As the map shows, it is very widely distributed (cf. p. lix); but there are three special centres: the Lower Ganges basin, the extreme south of Madras, and Burma. It is practically a question of labour and quality. For instance, in Gujarat very heavy crops are raised by irrigation from wells strongly impregnated with nitrates; but the leaf is strong and coarse. The patches in the north depend largely on normal irrigation—from November to February or May. Again, the chief growing area, 'Bengal', does little manufacturing, the bulk of its crop being shipped to Burmese cigar factories, Burma having a far larger proportion of traders than any other part of the Indian Empire. The best Indian tobacco, however, is grown in the south, where it is also manufactured, e.g. at Trichinopoly and Dindigul (Madura); and good tobacco is raised elsewhere in Madras, especially on the 'lankas' or islands of the Godavari delta.

As **jute** is a very exhausting and very thirsty plant, it is practically confined to the banks of rivers which send down annually great floods richly charged with silt: and the immediate hinterland of Calcutta practically monopolizes the crop. This fact, with the presence of cheap labour and cheap coal, has given the city a very large industry in gunny bags and jute cloth.

Though the second country in the world for export of **cotton** (cf. p. lix), India is not a promising area from the English point of view. About half the crop is used on the spot, mainly in Bombay; it is too short to be of much use for Lancashire machines: but its value for adulterating wool is often so high that it is in keen demand in Japan and Germany. The varieties cultivated may be roughly grouped as 'quick-ripening' (5 months) and 'slow-ripening' (8 months), the latter being unsuited to the shorter season in the north. The mass of the crop is grown in the commercial hinterland of Bombay, i.e. the Bombay Presidency, Central Provinces, Berar, Central India, and Hyderabad, especially on the 'black' basalt soil of the Tapti ('Surat') and Narbada ('Broach') basins, which owes its colour to the presence of loadstone and humus. This soil, however, does not suit exotic varieties; and, on the other hand, the inferior native varieties are hardier and more prolific, and so more favoured by the native cultivators. The best types are grown in Madras, e.g. round Madura and Tinnevelly, in Salem and Coimbatore; and the worst types—that are grown on a large scale—are those of the Punjab and the United Provinces. The quantity in the country is being increased, and the quality is being distinctly improved—mainly by careful selection of native seed.

With such a large area composed of rocks older, as in the Dekkan, or younger, as in Hindustan, than the Carboniferous—besides 200,000 square miles of thick basalt—the total amount of **coal** cannot be great; and, as the fields normally occupy definite basins, their total area is approximately certain and limited. The most important fields are those of Raniganj, Giridhi (Karharbari) and Jharia, the first two being about 150 miles from Calcutta along the main line to Patna and Delhi, while the Jharia field is about the same distance along the main line to Nagpur and Bombay. Most of the seams are bituminous, and some yield good coke, which must greatly encourage the working of the rich iron deposits of the country, e.g., at Barakhar. There are several minor fields, especially in the Damodar basin; and those in the Central Provinces, e.g. at Warora, are conveniently situated with regard to the main routes of rail. But the only one much worked is that of Singareni. The scattered patches marked on the map in Assam, Burma, Baluchistan, the Punjab, &c., are all of inferior quality or difficult to work. Of course, labour is almost everywhere fairly, if not markedly, plentiful and cheap, but it is far from efficient for mining purposes.

Rainfall Maps.

P. 34[A]. Between the vast continent of Asia and the enclosed Indian Ocean (or half-ocean), India cannot be normally self-contained or independent of its surroundings. It is, as a matter of fact, intimately related to the ocean in front, and distantly related to the surrounding plateaus, especially those of Irania and Tibet. Its relation to these plateaus is only 'distant' because the Himalayan axis has an average height of over 20,000 feet, so that cold air to the north of it can only gravitate *northwards*, while warm air to the south of it cannot push northwards. Even the Sulaimans have an average height of 6,000 ft., and so cut off the lower air-currents from the west; and so Hindustan is cut off, on all sides except the south, from the lower air-currents. It, therefore, becomes a terminus for ocean winds during one season, and a starting-point for land winds during the other season.

But the Indian Ocean is only half an ocean, with a double land influence; and this converts the permanent planetary circulation of the air—as seen over the Atlantic and the

Pacific—into a periodic regional circulation. This is true even in winter. For in winter all central and southern Asia is abnormally cold, averaging perhaps 20° F. below normal; and so dry 'land' winds gravitate out in all directions. During this season India is practically normal, having N.E. Trades blowing south of the tropic; but these are reinforced by cold dry air gravitating down the valleys of the Indus and the Ganges, and each drift is essentially 'monsoonal'. During this season, then, Bombay gets only 3 per cent. of its total rainfall; and the valuable spring rains (21 per cent. of the total) which fall in the Punjab are off normal S.W. Anti-Trades.

This Dry Monsoon lasts from the minimum temperature of mid-winter (Christmas) to the maximum temperature of spring-end (end of May); and it is divided into two parts, cold and hot. The cold season includes part of December, all of January, and practically all of February, with an extreme temperature down to 24° F. in such places as Rawalpindi or (the great *wool* market) Ludhiana; and during this time winds gravitate out from local causes, as elsewhere in Asia from continental causes.

During this cold season there is fine weather, with clear skies, light land winds, and considerable range of temperature between day and night. The highest pressure (where the highest latitude gives minimum temperature, and the lowest altitude gives a maximum column of air) is in the north of the Punjab. From this area, then, cold,dry, heavy winds gravitate out by the lines of least resistance; and there are only two such lines—down the Ganges Valley, and down the Indus Valley. In the former case, the wind must be north-west; but, as soon as it is free from the control of land-features, e.g. the Dekkan scarp, it swings to the right, and—once on the ocean—becomes a normal north-east wind, reinforcing the N.E. Trade.

As the heavy lower current begins to gravitate away from the Punjab high-pressure centre, the warm upper current of the quite normal S.W. Anti-Trade begins to be felt behind it, i.e. to the north-west; and it is from typical cyclones in the Anti-Trade current—fully 70 per cent. being of *Atlantic* origin—that the Punjab gets the spring rains which are of such value to its wheat-crop.

The hot season includes all March and April and practically all May, during which the surface warms up so rapidly that there ceases to be any gravitation of winds outwards, even if there is not as yet any inflow. During this hot season the weather is still fine; but as the temperature gets higher, the pressure gets lower, while over the South Indian Ocean the temperature is falling and the pressure rising. There is, therefore, an increased impulse of the S.E. Trades northwards, while any impulse to the N.E. Trades dies away; and eventually India becomes a low-pressure area, and the ocean a high-pressure area. May ending in fierce heat, with drought and dust.

These conditions, of course, are exceedingly favourable to strong 'land-and-sea breezes'; and the land influence will be strongest, e.g. on the Thar Desert and the sheltered flats of Chota Nagpore, while the circulation over the ocean will be typically 'clockwise'—off the high-pressure; and it is off this movement that the 'Bengal' area gets the spring rains (19 per cent. of its total annual fall) which are so useful to its rice-crop (half the total Indian output), and that Assam gets the spring rains (30[1] per cent. of its total) which are so useful to the tea-crop.

Like the Dry Monsoon, the Wet Monsoon is divided into two parts: extension and retreat. The former lasts from the beginning of June to the middle of September, and the latter from late September to the middle of December; and it is during the former that India gets its main supply of rain, nearly 90 per cent. of the total falling in less than four months. By the end of May a deepish area of high temperature and low pressure has spread round the Arabian Sea from the Sudan to Bengal; and special foci have arisen on each side of the relatively high pressure and low temperature of the sea, i.e. in the north-west of the Somali desert and the north-west of the Thar desert.

The temperature in the latter has risen to 110° F. even in May, and in June it increases still more, especially up under the lee of the Sulaiman Mountains, until towns like Dera Ismail Khan and Jacobabad are registering 126° F., and temperatures of fully 130° F. must be common in the Pat desert. These very high temperatures imply an entire absence of air-movement *towards* the south-west, i.e. such as is presented by the normal N.E. Trades; and, in the absence of any such resistance to the heavy air from the cool latitudes of the South Indian Ocean, the momentum of the S.E. Trades carries them as S.W. Monsoons across the Horse Latitudes to the Pat centre of low pressure and high temperature.

Once the Trades have been deflected into Monsoons, they share the normal liability of all westerly winds in the Northern Hemisphere to cyclonic developments; and these are quite normal in their behaviour, e.g. rotating contra-clockwise and having maximum rain on their left side. That is to say, maximum violence and maximum rainfall may be expected towards the north-west of each; and such a trend keeps those on the Arabian Sea more or less parallel to the Bombay coast, with little rain except out at sea, while it takes those on the Bay of Bengal directly across the Bengal and Orissa coasts, with heavy rain over the 'Indravati' forest.

The main current is, however, split by the Dekkan; and each part is subsequently guided along such mountain-faces as it meets, e.g. along the Arakan uplift, the Arabian current feeding eventually Bombay and the north-west, while the Bengal current feeds Calcutta and most of Hindustan.

Owing to the S.E. Trades having been attracted towards Northern Africa before they were attracted to the Indus Basin, the direction of the current across the Arabian Sea is from west-south-west tending to be due *west*; and the long clear course over the warmest ocean in the world gives it three times as much strength, and three times as much vapour, as the Bengal current ever has. But this markedly eastward flow takes it directly against the

[1] This 30 *per cent.* may be practically put down at 30 *inches*.

Western Ghats, where it is robbed of probably 300 inches of rain.

The Bengal current can approach India only through the comparatively narrow 'gate' between Sumatra and Ceylon, while the thermal focus is away up in the Indus Basin. Its direction is, therefore, west-south-west, tending to *south*, which takes it directly inland over the Bengal lowlands. Its eastward trend certainly does involve part of the current in the *cul de sac* between the Khasi and the Lushai Hills; and the forced ascent of a very abrupt face (as high as Ben Nevis) gives a terrific rainfall on the crest, e.g. at Cherrapunji. Most of the current, however, is diverted by the Himalayas from their most southerly apex—north-eastwards up the Brahmaputra valley or north-westward along the foothills from Sikkim to Kashmir. The more southerly portion of this 'Ganges' branch blows over the plain, which rises gently in latitude and in altitude towards the north-west; and it is this double rise, i.e. a double cause of precipitation, that accounts for the even distribution of the precious rain over the whole plain. While the main current is specially responsible for the 'Relief' rains, therefore, the cyclones work independently of the relief, and are the chief source of supply for the lowlands.

The distribution of the rain of course varies greatly. The normal annual fall varies from 3 inches in Upper Sind to 13 yards on the Assam Hills, while the extremes vary from 0 in Upper Sind to 25 yards at Cherrapunji. Daily variations are equally astounding: for 15 inches in 24 hours is common, 25 inches is not altogether uncommon, and over 35 inches have been registered.

During the retreat—from mid September to mid December—the same phenomena as before are still at work, and they still produce rain; but the area gradually contracts from north to south, and the amount deposited lessens—also from north to south. It contracts, as it spread, by 'bursts', and it ends, as it began, in a cyclonic storm. This, of course, is followed by a cool north-west wind, and high pressure begins to replace low pressure on the Indus plain. Gradually the current veers round—by the east—into the Dry Monsoon; and, in doing so, it obviously blows for a time directly against the Madras coast, bringing rain to a large part of the Dekkan. These rains, too, are of special value because they *mature* the rice crop.

As the land cools, and high pressure spreads over it, the sea becomes an area of low pressure, the focus of low pressure gradually moving southwards to and across the equator; and gradually the N.E. Trades begin to be felt, and are reinforced by the drift of cool air from the high-pressure centre in the Indus Plain.

Monsoon Asia: Geographical.

P. 34 [B]—34 [C]. This map brings out very clearly the essential features of the area, and suggests their economic or political importance. Railways obviously must for ages to come go *round* the high plateau; and very soon the only gap in the encircling line will be between Kushk and Chaman, where there are no real physical obstacles. Gaps in the edging folded mountains, especially where made by rivers, are becoming very important: and there are few obstacles to the construction of an 'inner circle' via the Irtish and the Zungarian Gate to the Weiho. It is specially important to notice the change in the direction of the great feature-lines of the continent—from the east-and-west Old World or 'Atlantic' lie west of Burma to the north-and-south New World or 'Pacific' lie; and reference to the sections on p. 50 [D] shows how the Pacific hinterland falls in terraces with steep scarp from the oceanic water-parting to the Tuscarora Deep.

The climatic importance of this is very great, e.g. in the matter of shelter, rainfall, &c. Thus, Peking, in the 'lee' of the scarp, is 7° F. warmer than Niu-chwang and 29° F. warmer than Vladivostok in mid-winter, though both the latter are on the sea. Again, the radiating of cold dry winds from the high-pressure centre in winter involves, e.g. north-west winds in Japan, bringing a considerable quantity of rain and snow off the sea of Japan. For the same reason all eastward projections of the coast, e.g. in Korea and Annam, get winter precipitation off outflowing winds which 'lag' westward as they move towards the equator. Conversely, the relatively feeble inflow (to the general continental focus of high temperature and low pressure), in crossing the feature-lines at right angles, gives a maximum rainfall, e.g. in south-east China, Japan, or north-east Korea.

Northern Asia: Orographical.

P. 34 [D]. The present conditions and probable prospects of Siberia may be studied in connexion with a comparison of the area with Canada. The immediate Atlantic hinterland of both is a forested platform of old rock (Lower Canada and European Russia); behind that is a metal belt, the 'cobalt' district of Ontario lying north of the Great Lakes as the 'Perm' district of the Urals lies north of the Caspian; and from this in each case there is developed a vast prairie, the 'black earth' reaching as far east as Tomsk and as far north as Tobolsk. East of Tomsk, as west of Regina, a step is climbed on to a sub-arid level; and from this there runs a forested Alpine wall, with the Gobi representing the Great Basin and the maritime highland of Amuria representing British Columbia. But the older continent has developed the plains of Amuria and Manchuria, and the climate of the district corresponds to that of eastern, not western, Canada.

In the west the Trans-Siberian Railway, like the old Mongol trails, follows the north edge of the prairie or good steppe; and, as this is practically the south edge of the swamp, it is relatively easy for crops to be brought long distances by water or over snow to the railway. In the east political events have interfered with the natural development of the line, compelling Russia to construct an all-Russian line (already in use locally) along the north bank of the Amur, to supplement the summer navigation from Stretinsk to Khabarovka—from the Ussuri Valley line to Vladivostok.[1]

The historic capital in the west grew up where the Tobol, as the line of approach from Russia, joins the Irtish (cf. the Assiniboine-Red River confluence at Winnipeg); but the balance of power has moved to the junction of Omsk, on the

[1] Excellent coal is mined at Soutchan and Dué (Sakhalin).

great westward bend of the Irtish, and is now moving to Barnaul. At the limit of navigation on the Ob, as Semipalatinsk on the Irtish,—with the coal of Kuznesk (Kuznitz) and the metals of the Altai immediately behind it, and magnificent pastures from Biisk to Novo Nicolaieff—it is likely to be the most important railway junction in western Siberia. Already it has displaced Kurgan as the great butter-market, having exported in 1913 nearly half the total sales (66,000 tons). The fact that Omsk stands second, claiming over a quarter of the export, shows how the industry is forsaking its old centres at Kurgan and other places in the Tobol basin. The freedom from ice at Windau, as compared with Riga, is reflected in the fact that five-eighths of the export is shipped from there. The development of this butter industry should be connected with two very important economic phenomena, (*a*) cattle-breeding for meat, and (*b*) bacon-curing, though the myriads of local pigs are as yet of very inferior quality.

Temperate Monsoon Area: Economic.

P. 35. Tea-growing in China and Japan is essentially a 'garden' industry, almost every family within the **tea** area having its own 'bed' of tea. Indeed, the habit of drinking tea is said to have sprung out of (*a*) the need for drinking only boiled water in a land where the density of population and the universal use of manure make water-bearing soil peculiarly poisonous, and (*b*) the desire to make the boiled water palatable.

In some respects China is more suited than India for the production of fine tea, e. g. the real winter giving a useful rest to the bush; but she has entirely lost her old position in the trade, her percentage of the total exports having fallen from 97 per cent. in 1864 to 72 per cent. even in 1884, to 30 per cent. in 1904, and not much above 20 per cent. in the present year. She still more or less monopolizes the Tibetan and much of the Russian market—for brick tea[1]; but her short season, her inefficient methods of manufacture (by hand), and her insufficiency of advertisement, have handicapped her in other markets.

Black and green teas are rarely made in the same district, though the difference is only one of fermentation; and little green tea is made in any district of the Lake Provinces (Hoope and Hoonan). The three maritime provinces and Kiangsi make both kinds, and in Chekiang they are even made in the same district; and in each case the early pickings (March) are usually reserved for home use, the inferior (May and August) pickings supplying the export. The Tibetan bricks are the special product of Sechuan (Chungking), and the Russian bricks come from Hoepe (Hankow).

In a mountainous land such as Japan the great demand on the limited lowlands for food-crops makes a hill plant such as tea particularly useful, and the Japanese combine gardens with plantations, and the hand culture of the Chinese with the machine manufacture of India; but, as green tea only is the normal product, little Japanese tea comes to England. As in China, the finest growths (often grown under artificial shade in Uji) are kept at home; and the export is mainly from the south of the 'mainland', especially from round the Suruga Gulf. But the 'tea' area is being invaded by the 'silk'-mulberry, as in Ceylon by rubber.

The Oolong teas of Taiwan (Formosa) are raised by a 'layer' culture not suited to India or Ceylon; and their manufacturing processes are midway between the black and the green methods. Before the improvement of the Kelong and Tamsui harbours, the export went via Foochow and Amoy—largely accounting for the high reputation of those two ports in the tea trade.

The limited distribution of **rice** (in any quantity) emphasizes (*a*) its dependence on irrigation, (*b*) the fact (cf. p. xxiv) that a large proportion of the population in this *temperate* Monsoon region live on still less valuable grains, e. g. millet, especially while the duty on rice is so heavy as it is in Japan. Its relation to density of population is, however, suggested in Japan, where more than half the cultivated land in the country (not 20,000[1] square miles) is under irrigation rice; and this accounts for the great value set by Japan on the lowlands of western Korea, and the rapid extension of railways there. Attention is also being paid to the development of cotton in Korea, for Japan pays £20,500,000 a year for raw cotton—more than half of it from India.

The **opium** has, again, now mainly an historic interest, but its economic significance is that it implies a relatively dense population, i. e. abundant and cheap labour. On the Great Plain of China, as also in the south-west, it is being replaced by cotton—Tientsin alone exporting, mainly to Japan, over 500,000 cwt. in 1912; in Manchuria by wheat and the soya bean[2], i. e. by purely export crops, for the staple food of both man and beast is millet. As the free zone along the Russo-Chinese frontier includes Blagovieschensk and Khabarovka, and as Manchuria has cheap wheat, cheap labour, and cheap transport, the flour-mills of Kharbin, Kuanchung, and Kirin are capturing the flour trade of the Far East. There is also a promising outlook for cotton in South Manchuria, to supplement the very short Chinese staple, which is suited only to weft work. As the junction for Kharbin and Kirin in relation to the two great ports of Dairen and Niu-chwang, Kuanchung is the point at which to judge the relative strength of Russian and Japanese influence in the area. China is of little importance, Japan's share in the exports even from Niu-chwang being over 90 per cent.

The opening up of Japan and China has given a very great impetus to their **silk** industries, their total export of silk having risen in the last six years from 28,000,000 lb. to nearly 40,000,000. In such overcrowded areas an industry demanding so little room and so much labour is of exceptional value, especially as the mulberry is a 'hill' plant. In China between 30° and 35° N., the industry is practically universal, but one-fifth of the silk is 'wild'. In the relatively inaccessible interior of northern Hondo it is relatively even more important; the insular climate encourages

[1] The Russian 'bricks' consist of the finer siftings and dust of ordinary tea compressed into slabs, but the Tibetan 'bricks' are only chopped twigs and stalks stuck together by rice-glue.

[1] But this small area supports fully 47,000,000 persons, even the 'usual' density being 2,000 per square mile of cultivated land.

[2] The soya bean makes an excellent forerunner of wheat in the usual rotation of crops.

a freer growth of leaves; and, as in Manchuria, the industry is not limited to the range of the mulberry, the famous 'wild' silk of Manchuria being raised entirely on oak leaves. The export from Japan in 1912 approached 23,000,000 lb., valued at considerably over £15,000,000. This was much the largest item in the list of exports, cotton yarns coming next (£5,480,000), followed by cotton tissues (£3,600,000); and it does not include £1,000,000 for waste silk or nearly £3,000,000 for habutae, while against the cotton there has to be set an import of raw cotton to the value of £20,500,000 (55 per cent. from India, 32 per cent. from U.S.A., and 9 per cent. from China).

In estimating the prospects of commerce and industry in **Japan** there are several important considerations. In the first place, the position of the islands, the direction of the marine currents, the indented and forested coast, are all exceedingly favourable to abundance and variety of fish; the total fishing population—supplying the most valuable of all animal foods used in Japan, as well as huge quantities of manure, &c.—reaches 3,000,000, with nearly half a million boats, forming an invaluable nursery for a mercantile marine.

As to industries, the one lack is of coal and iron, especially iron. Unlike China, Japan has very limited supplies of coal, and that of a rather inferior quality, its two advantages being (*a*) the position of the coalfields, e. g. close to the ports of Moji and Nagasaki, of Mororan and Hakodate, and (*b*) the almost universal use of wood and charcoal for domestic fuel: but the output has more than doubled in ten years (1902 = 9,800,000 tons and 1912 = 19,800,000), and there is an export of over 3,000,000 tons. The output of iron also increased very much from 1892 (20,000 tons) to 1902 (79,000), but progress since then has not been great: indeed, copper is the only metal that shows marked increase since 1902—from 29,000 tons to 66,000. On the other hand, the shape of the country offers exceptional facilities for cheap transport by sea; and her railway capital per mile averages only £8,000—against from £20,000 to £30,000 in Germany, France, and Belgium, and £60,000 in Great Britain.

China is probably the richest country in the world in coal and iron of first-rate quality, and already exports some 200,000 tons of iron-ore to Japan; but her activities are not confined to the mining. With abundance of labour at a cost of 4*d.* or 5*d.* a day, she is taking the first steps towards dominating the world's iron industry. The one great centre at present is Hanyang, drawing its ore from the Ta Yeh mine (80 miles distant by water, and yielding 60 to 65 per cent. of metal) and its coal from Pinghsiang (Kiangsi). All the rails for the Peking-Hankow line were supplied by Hanyang, and pig iron is being shipped over to the United States. The export of coal is still trivial except for 1,000,000 tons via Dairen from the Manchurian mines at Fushun; but every province of China contains coal, and in some it is found in extraordinary abundance, e. g. in Shansi, where anthracite lies in thick, horizontal, and undisturbed seams that can be *quarried*! The output for the Kaiping and Lanchow mines in 1912 reached 1,700,000 tons; the Honan mines yielded over 500,000 tons, the Shantung nearly 600,000 tons, while those near Dairen yield about 5,000 tons a day.

Africa: Physical and Economic.

Pp. 36, 37. The low **temperatures** to the north of the January map represent high pressures and cold winds, with the neighbouring ocean as a low-pressure area, while the large oval of high temperature in the south-east of the continent is flanked by a wide expanse of ocean associated with relatively high pressure. This distribution of pressure involves inflowing winds over the whole continent. Except therefore for cyclonic storms along the Mediterranean coast, especially in Algeria, there is little rainfall over Northern Africa, for the steady increase of temperature southward is adverse to condensation and the winds are far from saturation. Even in Peninsular Africa similar conditions obtain; for instance, the high temperature of the low eastern coastlands minimizes the precipitation off the N.E. Trades, and the Harmattan is very dry. So the precipitation off the S.E. Trades is minimized east of the Drakensberg scarp, while in the west the *south*-west wind is coming from the high-pressure focus and over the cold Benguela current. It is the combined influence of these two that accounts for the very low temperature of the south-west coast, especially up to C. Frio ('The Cold'). The cold Canary current affects the course of isotherm 70° F. *west* of the African coast; but, as the winds there are the N.E. Trades, i. e. off-shore, it does not affect either the temperature or the rainfall.

In July, the shape of the continent and its relation to Asia prevent the high-temperature area from being, like that in Southern Africa in January, practically coterminous with the low-pressure area; for while the pressure near Khartum is 29·7, at Makalla (Hadramaut) it is 29·6, and at Muscat 29·5.

Over most parts of the continent, therefore, winds tend to blow eastward; and the easterly inflow across the Guinea coast, is a strong south-west Monsoon. When this blows at right angles to the scarp, forced ascent causes heavy **rainfall**; but when it blows generally parallel to the coast, as along the Gold Coast, the rainfall is much smaller. Another result here is the upwelling of cold water, a phenomenon repeated off the Somali Coast by the 'Indian' south-west Monsoon. The great heat and low level of the Sahara are, however, adverse to condensation; and along the higher and cooler Angola coast winds do not blow landward, while on the Mozambique coast they are dried by Madagascar, and the interior of the continent in the same latitude is an area of relatively high pressure, with a tendency to outflow.

The extreme western edge of the great Monsoon movement in the Indian Ocean and the Guinea monsoon off the Atlantic combine to feed Abyssinia with the 12 inches of rain marked on the map, and with at least as much in August.

The area of **wet jungle** is relatively small, for the general altitude is much higher than in the Amazon basin, and the Monsoon character of the winds implies a dry season; but,

besides the normal equatorial rains, the position of the Congo basin guarantees that either northern or southern tributaries are always in flood, so that much of it is covered with Selvas supported by non-local rains. The typical products are oil-palm along the coasts and rubber in the interior.

North, east, and south of the forest is savana, strongly park-like on the forest-edge and arid grassland on the outer edge. It is the most typical association in Africa, and has been very favourable to relatively dense population (Ctr. the South American tropics), easy communication (cf. the Bantu expansion), and great abundance of animal life. In several parts of it European influence is spreading the cultivation of cotton, especially in Nigeria and Nyasaland.

Where the exportable wealth is of forest origin, e. g. rubber and palm-oil, the waterways have been of prime importance; elsewhere the physical obstacles on the waterways have encouraged land routes—associated with camel, or bullock, or slave. And as the presence of disease-carrying flies—fatal to beasts—often made the slave the only possible source of animal labour, the real development of the continent has had to wait for **railways.** The best route for a transcontinental line from north to south was obviously over the savana; and the approach to this from the early focus of population round Table Bay followed a line of volcanic disturbance along the Indo-Atlantic water-parting. This disturbance had resulted in the wide distribution of mineral wealth, e. g. in the crater-chimneys of the Kimberley diamond mines, and so provided both the means and the motive for the construction of such a line. For hundreds of miles both from the Cape and from the Cairo end the line is already in use.

The political distributions may be associated with a triple division of the continent into deserts, coastlands, and highlands; for the effects of the massive form of the continent have been accentuated by the unhealthiness of the coastlands and the paucity of natural routes inland, and these in turn may be associated with the political condition of the indigenous peoples, especially in relation to the slave trade. Behind all is the fact that it is a continent in which a few natural features have been developed on an enormous scale, but with the maximum of monotony.

General Economic Map.

P. 38. In such an area the temporary, or exhaustible, wealth—to be of maximum value—should be, as it is in Africa, in the form of **gold,** so that it is at once a motive to, and a means of, opening up the country and tapping its inexhaustible vegetable wealth. And the relation of this to the political distribution of European nations is important because it decides the pace of the necessary transition from the exploitation of jungle products to the economic development of plantation products—a transition which largely depends on provision of transport (of a kind immune from insect-borne disease) both for the products themselves and often for the requisite import of labour. The great jungle product so far in Africa has been rubber, already being raised as a plantation product; and the oil-palm is nearly as important. But both are products of 'Central' Africa, i.e. a region which is as yet undeveloped economically.

Hitherto the only important **commerce** has been connected with the two extremities of the continent, especially Egypt and Algeria and what is now the Union of South Africa; and even here the activity has been limited. In the north the similarity of 'Mediterranean' climate and products has minimized any local interchange of products; and, though there has been more variety in the south—along with a less difficult hinterland—the ox-wagon was not a much better commercial medium than the camel caravan.

All round the coast, except in the west of the Sahara and the Kalahari deserts, there is now a belt of considerable commercial development, emphasizing the fact that Africa must always be developed from the ocean, and thus throwing light on the British possession of the most favoured areas; and, as Africa will never be a manufacturing area, nor in the meantime make any considerable demand for manufactures, its trade routes must be associated with the export of raw materials. These can, in many places, be carried for hundreds of miles on rivers the lower parts of which are isolated by falls and rapids; and the great problem is to link these navigable routes of the interior with the ocean by rail.

Here is the importance of the great continental water-parting, and it is practically along that line that the 'Cape-to-Cairo' route is stretching—combining in itself lengths of rail and lengths of navigation; and in that double form, not in the impracticable continuous rail, it is working already over fully four-fifths of its total projected length. It is tapped mainly, of course, in the extreme south, e.g. from Port Elizabeth and East London, Durban and Lorenço Marques; but it has also important links on both tropical margins, i.e. from Beira to Bulawayo and from Port Sudan to Berber, and the British equatorial line from Mombasa to Port Florence has now a rival in the German line from Dar-es-Salâm to Kigoma[1] (a better port than Ujiji). These 'equatorial' lines have both political and economic importance because they tap a large area which is high enough and dry enough to be relatively healthy.

Even on the west coast considerable progress has been made in the same direction. Apart from small 'link' lines, such as the Matadi-Leopoldville line round the Lower Congo rapids, there are a number of definite 'development' lines, especially in the German territory, about 2,000 miles of line being in operation in German South-West Africa alone. But further extension of either the 'Otawi' or the 'Windhoek' line, as of the lines from Loanda and Mossamedes, is unimportant compared with the routes in the Belgian Congo. The *Grand Lacs* line from Kabola to Lake Tanganyika is now practically finished, thus giving a complete trans-continental connexion from Banana to Dar-es-Salam; and the Katanga line has already reached 400 miles eastwards from Lobito Bay and 200 miles westward from the Rhodesian frontier.

[1] This line 777 miles, has reduced the journey from the coast to the lake by 10 days.

In the Western Sudan and Guinea regions, again, similar activity has been shown, especially in the French and British spheres. Some 900 miles of line are in operation in Nigeria; and France has nearly as much tapping the Upper Niger from Dakar and Conakry. There are also two Algerian lines being constructed across the Sahara, one to the Middle Niger and the other to Lake Chad. The present termini are at Colomb Bachar and Tuggurt, but the latter line is already being continued to Wargla; and the stretch of absolute desert to be crossed is only some 200 miles. With the application of direct sun-heat for raising 'power', the ultimate success of these lines seems absolutely assured, and the eventual reclamation of the Sahara only a matter of time. In the meantime, however, the rapid development of transport in the Nile and Niger basins has ruined the trans-Saharan trade (originally centred on Tripoli), and has killed the local salt industry by the importation of cheaper salt from Europe.

The history of the acquisition of the Tripolitana area by Italy is apt to be obscured by the artificial importance attached to the Bay of Tobruk as a naval station. The expansion to Tripoli, however, was far from being only a matter of foreign policy: for the emigration of Italians to the New World had grown to such an extent (4,300,000 in the last decade) that an imperious need had arisen for the annexation of the only 'available' area near at hand which had both a reasonable economic future[1] and similarity to Italy in geographic conditions.

In the meantime the typical products are still essentially 'earth-gifts', e.g. such typical desert products as dates and gum arabic (acacia), such typical jungle and forest products as rubber and ivory, and such a typical savana product as cattle; and obviously the transition to economic cultivation depends on the **Europeans**, but it is not a simple problem. So much of the interior proved to be barren and therefore unprofitable, and so much was otherwise unsuited to Europeans, that European influence came to coincide with oceanic drainage, where an effective ocean-base was backed by a line of least resistance for intrusion and expansion; and most progress was made where, in spite of the climate, the great rivers were most favourable, e.g. the Niger (to the Mohammedan Sudan savana) and the Zambesi (to the Pagan Bantu savana). The Mohammedan area, in climate, resources, and organization, had the advantage; for, though Islam was associated with the slave trade, it had been established so long that it had come to be regarded as a 'native' religion, and it is peculiarly adapted to raising and assimilating the conquered. Christianity made its early attack on Pagan Africa: and Christian denominations, like their European Powers, were intensely hostile to one another, while so-called Christian traders violated all known Christian laws. The result was that European control of the savana areas of Pagan Africa had scarcely anything to its credit except the conduct of certain Chartered Companies.

The great problems now include the acclimatization of Whites, the establishment of just and stable government, the provision of transport, and—above all else—the organization of willing labour. Comparison of the Population map with those of Rainfall (pp. 36, 37) shows that the density varies with the rainfall—from very low to heavy, only falling off where the rainfall becomes very heavy. In the Congo and Niger basins, therefore, as in Egypt and on the Zanzibar and Mozambique coasts, the population for ages must have been dense; but the monotony of relief on the vast savana discouraged political cohesion, so that large numbers of the natives were thrust back and robbed of their land, or annihilated by sword and alcohol. Both in Mohammedan and in Pagan Africa, however, Britain acquired the most favoured areas; and these are of special importance.

[1] The Romans gathered immense barley harvests from the area.

Tropical British Africa.

Nigeria has three products of prime interest: tin, cotton, and vegetable oil. The Bauchi tin-field is only of fair importance, exporting some 5,000 tons of concentrate a year. Practically all of it is of alluvial origin, and the deposits are rich and very easy to work; but they are patchy and small in area, neither climate nor labour-supply is favourable, and railway rates are very heavy.[1] The projected railway from the excellent new harbour of Port Harcourt, on the Bonny estuary, via the large and fairly good Udi coalfield, will undoubtedly help the mining industry; but the importance of the tin field at present is overrated.

As to cotton, the fact that several million people have for ages been clothing not only themselves but also a large proportion of the coastal population between Tripoli and Lagos has been over-emphasized; for the local price—often even in recent years at least twice as great as that of Liverpool—has given an artificial stimulus, and the local staple is distinctly inferior. The advantages, no doubt, are: (*a*) that the natives have a wide knowledge of cotton-growing, (*b*) that the dry harvest-time guarantees fine 'condition', (*c*) that it is the one 'cash' crop amongst people whom the recent railway construction has made familiar with, and anxious to obtain, the silver currency. But cotton can never become of prime importance, because the long drought (November to March) limits agriculture to seven months; and the food crops (Guinea corn and other kinds of millet) must be secured *first*, so that late or light rains may delay the gathering of the food harvest until even the quickest-growing cotton cannot mature. Between the latitudes of Zaria and Sokoto, however, not only is the soil very fertile, but also intensive culture and irrigation are employed, so that the population is very dense, especially round the historic cotton market of Kano. Here, too, the combined influence of Semitic races, especially the Fulani, of Islam, and of the Hausa tongue, has been very favourable to economic development.

Racial characteristics, however, are not always favourable to modern development; and, in this case, the influence of the Fulani on the cattle-breeding is very important and very widespread in the Western Sudan. For they do not breed

[1] While a native can travel from Bauchi to Baro for 7*s.* 9*d.*, it costs more than that to send even 1 cwt. of concentrate the same distance.

cattle with any intention of slaughtering them or selling them for that purpose!

As the cattle and cotton industries are typical of the low (1,000 ft.) northern plains, where cereal foods are eaten over an area of 150,000 square miles, and where the rainfall may not exceed 16 inches, so the vegetable oils are typical of the 80,000 square miles of forest in the south, where the staple foods are yams and other roots, and the rainfall may reach 120 inches. Palm products are exported to the value of some £5,000,000 a year, the oil mainly to England and the kernels to Germany; and the industry represents 90 per cent. of the purchasing power of Southern Nigeria. The oil-palm is found over all the area on the map coloured for 'rubber', but the dense forests are within 200 miles of the coast, and the chief supplies are exported between the Gold Coast and the Cameroons, Nigeria being much the most important. Here, in the conversion of the earth-gift into a plantation product, the vital problems are (*a*) to replace thick-shelled kinds by thin-shelled, and (*b*), where labour is lacking, to introduce machinery for cracking the nuts—now done entirely by hand. Up-country shea and ground-nuts supplement the oil-palm.

The two British parts of the Bantu savana are very similar in relief, but have considerable differences of climate; and in the north there is a very difficult health problem. In other respects, however, the north is much favoured. Historically even, **Uganda** has had the advantage of two such valuable commercial media as the Indian traders and the Swahili[1] language; racially, it contains in the Baganda the highest type of the Bantu race; economically, it has special facilities for raising cotton—of fine quality and heavy yield per acre—particularly round Lake Kioga. As in Nigeria, the crop is the great 'cash' crop; and, since the natives are both numerous and very capable, only transport and willingness to labour are needed to make the industry—which is entirely in the hands of the natives—very important. In the one year since the opening of the Busaga railway between Lake Victoria and Lake Kioga there has been a remarkable increase in the export of cotton, which reached a total value of over £250,000; and, with the completion of the motor road between Lake Kioga and Lake Albert, and the consequent further release of human labour from porterage, there must be still more rapid development.

The food question here is not so vital as in Nigeria, partly because of the large surplus of maize in the East Africa Protectorate, and partly because the two great home crops are sesamum and ground-nuts—the latter, as a leguminous crop, rotating admirably both with the sesamum and with the cotton. The character of the climate may be judged from the excellence of the coffee, which—like that of the East Africa Protectorate—sometimes fetches the highest price in European markets. Indeed, coffee has become the staple of the *European* planters, though it will presently have to compete with cacao and rubber.

The one real problem is the labour, for geographic conditions and racial character and custom are alike discouraging; and this must be taken into consideration. For instance, the Masai, who are probably richer in cattle than any other uncivilized tribe in the world, have hitherto—like the Fulani—kept their cattle not for slaughter, still less for sale, but simply as a sign of their own importance.

The position in **Nyasaland** is not quite so difficult—though the attraction of the mining industry is more felt, and cotton-growing is becoming more and more popular. The acclimatized 'Nyasa upland' is now classed with Egyptian cotton, and the output for 1912–13 considerably exceeded 3,000,000 lb., valued at over £80,000; and the extension of the Shirè Highlands line to the Zambesi at Kaia, with the consequent freedom from dependence on the treacherous Shirè river, must give a further impulse to the growing of both cotton and tobacco. These two crops, with their quicker and surer return, have quite displaced coffee; and, as the tobacco is surer than the cotton, it is slightly the more popular. The Lower Shirè district, however, where the crops are specially 'native-grown', often suffers severely from drought; and the Shirè Highlands, i. e. the European area, are not suited to Egyptian varieties of cotton. The 'bright' (i. e. pipe and 'Virginia' cigarette) tobacco, like that of Rhodesia, if cured like typical Virginian leaf, is of excellent quality, and the crop last year weighed over 2,250,000 lb., valued at nearly £60,000; but until the Shirè line is extended from Kaia to Beira there must be risky and costly transhipment at Chinde.

Tobacco, like various kinds of hemp, is equally well suited to the neighbouring Portuguese territory; but the main crop at present is sugar, with rubber as a—probably futile—obsession. The typical low veld of the territory could support at least 1,000,000 cattle, with proper precautions, and maize is a natural product.

Temperate British Africa.

P. 39. The great **maize**-lands of the continent are, however, essentially associated with the Union of South Africa, which will probably come to control the world's market for the grain (cf. p. li). With an area of 475,000 square miles, and a population of 1,250,000 Whites and 4,500,000 Natives, it has a great variety of climate—e. g. the rainfall varying from 1 inch in the copper district of Namaqualand to 100 inches on the wooded hills of N.E. Transvaal—and therefore a great variety of products; but here the obsession has been mining, the total mineral output in 1912 being valued at about £50,000,000, while the total agricultural output scarcely exceeded £11,000,000. The great promise for the future lies in the fact that the Union, with its compact form and natural frontiers of sea and semi-desert, forms an admirable unit for agricultural administration, with a general climate specially adapted to the most modern developments of dry farming. Not only is the whole local demand for maize (the staple food) satisfied, but there is also a very large export to Europe and Australia; and the number of cattle, as of sheep, in the area has increased nearly 50 per cent. in recent years, though all the provinces still import some meat.

The wine of the Cape is as typically a summer-drought

[1] Swahili is now, almost as specifically as Hausa, the name, not of a tribe, but of a *lingua franca*.

product as the sugar of Natal is a summer-rain product; and where the summer-drought merges in almost constant drought, the patches of guano—which any serious rainfall would have dissipated centuries ago—mark the attraction of millions of sea-birds to the fish brought by the cold current. (Cf. the Agulhas fishery.)

The **wool** and cattle industries have some peculiar features. Relatively, like the rest of the Southern Hemisphere, the Union has a high percentage of sheep; and the climatic conditions throughout that hemisphere, e.g. the typical bareness of 'grassland' in the dry season, favoured sheep as against cattle. Nor is the wool industry in the Union—any more than in Australia—as yet a by-product of a meat industry; indeed, all the provinces in the meantime import both beef and mutton, mainly from Australia or Argentina. But the distribution of wool in the Union is clearly dependent on the rainfall. Thus, the bulk of the Cape wool is raised on the better-watered eastern half of the Karroos, and therefore is exported via Port Elizabeth and East London. It comes from both sheep and goats, and in each case throughout the driest areas native animals are preferred to angoras and merinoes; but on the Great Karroo the latter are exceedingly important, especially round Graaf Reinet, where the red clay economizes the rainfall, and contains saline elements very useful to the animals.

The distribution of the **cattle** is less climatic and more economic. The whole development of the area has been based on ox-wagon transport—reflected even in the broad streets of Cape Town; and everywhere amongst the Zulu-Kaffirs the ox has been king, and his slaughter has been associated definitely with war. Indeed, one of the greatest difficulties originally in connexion with rinderpest was that the order to slaughter infected cattle was looked upon by the natives as a direct challenge to war.

The Union practically controls the ostrich-feather market of the world, though ostriches are now reared in several other countries, e.g. U.S.A., Argentina, and Australasia.

The great **gold** output is from quartzose reefs in the older Primary rocks of the Transvaal and Rhodesia, and the conditions of work involve steady and skilled labour such as is adverse to the social evils typical of alluvial mining, while the depth of the deposits gives further stability to the operations. The policy of working simultaneously large areas at different stages of development also guarantees a highly profitable—though actually low—average value, the grades from the entire Rand showing similar characteristics and yielding comparable profits. The addition to the purchasing power of British markets is, therefore, like the influence of the stream of gold on the Imperial bullion market (London), relatively steady. Moreover, the presence in the country of engineers and metallurgists is leading, as it has led elsewhere, e.g. in Canada and Australia, to the development of other branches of mining.

The greatly increased demand for copper in electrical work, and the great advances in mining machinery and organization, have doubled the importance of the copper-fields; and scientific working has brought stability into the diamond industry, as into the gold mining—sand-washing, as on the shore of German S.W. Africa north of Elizabeth Bay, being supplemented by search for the volcanic neck from which the stray stones have been water-borne, and in which the 'blue clay' of the old lava keeps the mother lode still embedded.

It is precisely the overwhelming importance of gold and diamonds in the Union that makes the real **Cape Route** so unsatisfactory for steamers; for while the wants of the Union are still for heavy cargoes, e.g. coal, timber, machinery, grain and flour, &c., the valuable exports are of goods of immense value in small bulk. With no coal worth mentioning, then, and no heavy cargoes out to attract cheap coal in, and no prospect of rapid increase in population, the Cape Route is peculiarly unattractive to the tramp steamer; and its recent increase in traffic from North America (petroleum) is not likely to survive the effectual opening of the Panama Canal, especially as vessels cannot—for fear of ice—use a Great Circle route between the Cape and Australia. It will, however, probably retain freight traffic from Europe to Australia—for that saves nothing *in cost* by going via Suez, and prefers the less crowded route via the Cape.

North America: Physical and Economic.

Pp. 40, 41. The four **climatic maps,** when related to those of relief and vegetation, illustrate most of the important phenomena in the Economic Geography of North America. The land has enough variety of altitude for all kinds of climates, and is large enough for considerable extremes in the interior—modified by the Gulf of Mexico and Hudson Bay. Normal atmospheric circulation involves on-shore Anti-Trade winds in the north-west with cyclones, and on-shore Trade-winds in the south-east without cyclones, the west coast having a very typical summer-drought area in 'Mediterranean' latitudes, and the east coast having a fairly typical Monsoon in-draught in 'Chinese' latitudes. The low-pressure centres over the two oceans, with their special winter activity and their contra-clock movement, mean warm southerly winds to the north-west coast, but cold northerly winds to the north-east coast.

The January isotherms reflect pressure as well as direct temperature, for—as in Asia—there is a triangular area of very high pressure (with its centre over Nevada and its apex pointing northwards) between the pronounced low pressure (29·6) of the North Pacific and the still more pronounced (29·5) low pressure of the North Atlantic—the latter accounting for the prevailing northerly winds and heavy winter precipitation of Lower Canada. As in Asia, again, this high-pressure centre does not correspond with the centre of lowest temperature, but represents a compromise or poleward displacement of the normal high-pressure belt—the frozen water in the north acting as land; and the cold outflow from this centre occasionally gives frost even to San Diego.

The January rainfall emphasizes the relation of the relief to the warm, wet on-shore Anti-Trades in the west, the snow-fall on the Rockies probably reaching 400 inches

towards the north; in the south they bring rain to the Ohio basin off the Gulf of Mexico, cyclones following the line of least resistance offered by the St. Lawrence river and lakes with its relatively low pressure.

Comparison between the two Rainfall maps shows how relief minimizes the influence of the Pacific, giving a narrow Pacific climatic province, and a wide Cordilleran province, and a still wider Gulf-Atlantic province. The last of these is very large and generally very uniform, but in winter the isotherms are crowded towards the north, and there are relatively rapid changes, because the Atlantic has relatively little influence apart from that exercised by the Iceland low-pressure centre. Everywhere, however, the great changes are in moving east-and-west, not north-and-south; and great range is typical of low humidity, as between the Sierra Nevada and the Rockies. This applies even to the ocean. Thus, the winter isotherms are wider apart along the Pacific coast than along the Atlantic, because the warm current works north and the Anti-Trade is so steady; but in summer the Japan Stream is nearly 1,000 miles off shore, and there is an upwelling of cold water at the source of the Trades, with an outflow of cold air from the high-pressure (30·3) centre. All this is reflected in the range of annual rainfall from 10 inches in South California to 100 inches in British Columbia.

Comparison with Europe will bring out the influence of **relief**. The great barrier of uplift in the west, the considerable barrier in the east, and the absence of any barrier between north and south, combine to make the climate more uniform and simpler than in Europe. The uniformity of the central plain causes rapid and wide distribution of climatic phenomena—of High-Pressure type in the continental winter and Low-Pressure type in the continental summer, the consequent inflow of warm moist air in summer being essentially monsoonal. The long hard winter causes vegetation to develop late, but the hot damp summer makes it grow very fast; the short spring encourages trees to make fruit rather than wood, while the dry autumn is very favourable to easy harvesting.

The relation of climate to **vegetation** is well illustrated by Canada. In the east, where great range of temperature is associated with great precipitation, coniferous forest is associated with snow. In the west, where the precipitation is great but the range of temperature small, giant conifers are associated with rain. In the centre, where greater range of temperature implies very small precipitation, the typical formation is grassland. Between the Great Lakes and the Atlantic, across the path of the cyclonic storms, the lower latitude and the Ontario clay are associated with the deciduous oak, maple, and beech; and north of the grassland there is 'swamp' forest—aspen to the south and spruce farther north.

As to density of **population**, it is generally true that 'agriculture' distributes, while industries concentrate; but a pastoral population is normally thinner than a tillage population, especially if the soil is very fertile and the climate is very favourable, e. g. loess in a Monsoon area. Old-established areas, such as the St. Lawrence valley and the New England States, again are normally denser than newly opened areas of similar kind; and where 'old' areas are historic lines of movement, such as the St. Lawrence and Hudson valleys, modern railway development is almost sure to encourage still denser population. This is specially true, of course, where there is mineral wealth; but again it is necessary to distinguish between coal and iron, on the one hand, which distribute the density over *areas*, and e. g. gold, on the other hand, which concentrates it in *spots*. Thus more than half the U.S.A. population is found east of the Mississippi and north of the Ohio and the Potomac—i. e. an old-established area, containing some very important historic routes and some exceedingly valuable coal and iron fields. Cf. p. xviii.

Industrial Map.

P. 42. The distributions on this map should be compared with that of population on p. 41, and discussed in light of the fact that, especially in U.S.A., the cheapness of land has been, and still is to some extent, adverse to scientific agriculture, as it was to the early development of manufactures. The details of distribution are supplied on pp. 42[D] and 43; but it must be remembered (*a*) that only 'cash' crops are emphasized, though in nearly all areas the majority of the crops are used on the spot, (*b*) that the development of scientific agriculture means the encroachment of rotation on the area under single 'cash' crops, (*c*) that the invention of machinery and the transference of many operations (once done on the farm) to centres of population are reducing the density in most agricultural areas, though the output per acre is being increased.

The distribution of **live stock** reflects the same conditions and influences. The colouring on this map refers practically to sheep and 'beef' cattle, for milch cattle are intimately connected with city development and pigs with agriculture, 'corn' (maize) in well-watered areas and alfalfa in arid areas. Pigs are also a natural adjunct to the dairy industry; but abundance of water is essential, and extremes of temperature are very unfavourable.

While pigs are largely confined, therefore, to the 'corn' and cotton belts, especially the former, beef cattle and sheep are still more definitely confined to the Western States. Deducting the dairy cattle, two-thirds of the cattle are west of the Mississippi; but the 'ranch' is dying out with the disappearance of free land, and the North Central States are now the special area, with 11 per cent. of the cattle numerically and 46 per cent. of the total value. These conditions emphasize the fact that more than half the total U.S.A. population, i. e. the mass of the consumers, live in less than one-seventh of the U.S.A. area, i. e. east of the Mississippi and north of the Ohio-Potomac line.

Both sheep and pigs are now almost as numerous as cattle; but the number of cattle has decreased less rapidly than their ratio to population, which has fallen fully 20 per cent. in twenty years, and the value has risen considerably. The latter, however, varies with climatic and other conditions, e. g. access to transport, as shown approximately in the following table:

Area.	Number of Cattle.	Value.
7. Westerly N. C.	12,300,000	£54,500,000
11. Far West States.	8,000,000	£35,000,000
6. Easterly N. C.	5,000,000	£18,500,000

Historically, the 'plains' west of 100° W. were too dry for good farming till quite recently; and though they afforded some good herbage, they could not carry many cattle to the square mile, so that under the Homestead Law they were of little use. Even as common lands with freedom of range, they were speedily overstocked: and in droughty seasons close cropping prevented the grasses from seeding over so large a proportion of the area that its power to carry cattle has been 'permanently' reduced. Irrigation and alfalfa are now compensating, but the future for profitable cattle-rearing probably lies with the Cotton States, which in climate, ease of transport, need for manure, &c., have special advantages.

Sheep, of course, are hardier than cattle, and do more harm by close cropping: and their distribution is significantly associated with the actual line of the Rocky Mountains—from New Mexico to the north-west of Idaho and Montana. In the Eastern States farmers devote their attention to mutton, as to milk, the personal attention on the small farms being much more favourable, especially to lambs, than the 'natural' conditions of the open lands of the mountain belt; and there are areas in the Appalachian belt, especially in the rugged New England States, very suitable for sheep-rearing.

The distribution of **mineral wealth** illustrates the evolution of the continent from a V-shaped Archaean nucleus, the scarp of which is characteristically rich in the commercial metals, especially iron and copper; and, as the richest known deposits are round Lake Superior, there are maximum facilities for transport. Nearest to this Archaean block in geographical position, as in geological time, is a belt of Old Sedimentary rock, the physical history of which has left it rich alike in water-power and in various forms of fuel—from oil to anthracite. And its economic relation to the old block is expressed in the hardware industry, with extreme points at Montreal and Birmingham and its focus at Pittsburg; while its climatic relation to the flanking ocean is expressed in the textile industry, focused hitherto in Massachusetts.

This is also the pivot of the U.S.A. **fishing** industry, and the southern focus of the Atlantic fishery in American waters. The importance of this fishery, as of others, cannot be gauged at all from the cash value of the total 'take', for it has been the essential basis of the whole marine development alike in Newfoundland, Canada, and the United States. Both the fiorded coast and the wide continental shelf are exceedingly favourable to the industry; but constant fog, wandering icebergs, the methods of fishing (e. g. by trawl), and the fact that the three great grounds are in the direct line of several transatlantic routes, make the industry one of the greatest danger.

The temperature of the water, as controlled by the Labrador current, is of considerable importance, especially in the cod fishery, so that the largest hauls of cod are made where the climate is least favourable to other occupations, e.g. agriculture—off Newfoundland (and Labrador), while the smallest hauls are made off Massachusetts, where they are supplemented, however, by large hauls of halibut, hake, and clam. The three great ports are St. John's, Lunenburg, and Gloucester: but market facilities favour Boston and Halifax, and different sections of the coast have different products. For instance, the shad is a special product of the Chesapeake, also very famous for its oysters, though both are plentiful also farther south, as lobsters are farther north. Herring, too, are exceedingly numerous north of Cape Hatteras, especially in the Chesapeake, and the New Brunswick herrings are converted into 'sardines' at Eastport. The Pacific fishery is mainly for salmon, which are extraordinarily abundant, but halibut is also important; and the warm, almost tideless waters of the Californian Gulf are famous for their pearls, while the growing importance of the fresh-water fishery—e. g. for lake trout and white fish—is affecting the demand for fish from the Atlantic markets.

The distribution of **manufactures** is intimately associated with transport and power, whether from water or fuel (cf. p. 43); and most of the great transcontinental routes were historically associated with the coalfields of the Eastern States and the goldfields of the Western. Modern development depends on (*a*) nearness to raw materials (including fuel) and to markets, (*b*) climate (including water-power), (*c*) labour, which—like capital—favours areas which got the momentum of an early start.

For instance, the wide expanse of forest (for charcoal) located the early **iron** industry at any point on the forested limestone of the Appalachian area where iron is found; the first coalfield opened up was that of Eastern Pennsylvania, the anthracite of which could be used for smelting without being converted into coke; and when the anthracite became too valuable for this purpose, Western Pennsylvania had fine bituminous ('Connellsville') coal close to the iron and the lime. And Pennsylvania still remains the chief iron-working State in the Union, though of no importance now as an iron-miner. Alabama is now the great iron-mining State in the Appalachians, while Pennsylvania draws its supplies from Lake Superior, the 1,000-mile haul of the ore being compensated by the very short haul of the fuel. But this is only possible because the Minnesota and Michigan deposits are so rich and so near the surface that they can be steam-shovelled into trucks to be water-borne to various ports between Toledo and Buffalo, especially Cleveland, Ashtabula, and Conneaut; and the ultimate market for the mass of the manufactured product is eastward again of the manufacturing focus in the 'Pittsburg' region of Pennsylvania and Ohio.

Improved methods of making coke (from almost any kind of coal), economy in handling ores, advantages of blending ores, and other causes are, however, becoming more and more adverse to the 'Pittsburg monopoly'. For instance, local coal and ore support at Denver an iron industry which has no rival within 1,000 miles; the large agricultural market behind Duluth led to the importing of Pittsburg coal (for a local industry) in the boats which carried Lake Superior ore eastwards; the old centres in Eastern Pennsylvania have

special facilities for importing ores for blending, e. g. from Cuba, Newfoundland, Norway, &c., and for marketing in the great 'Atlantic' cities. Future development will be at water-side points between coal and ore, e. g. Chicago (Gary) —between the Indiana coal and the Escanaba iron—with its market mainly westward, while for the eastern market perhaps Buffalo, at the terminus of the Erie Canal, has the best position.

Except for the small Canadian industry along Lake Ontario, the **cotton** manufactures of North America are located on the Atlantic coastlands, the finer work being done in the north, especially in New England. In spite of the small local food-supply and the entire absence of coal and raw cotton, the industry rose here—based on high humidity, the water-power of 'glacial' streams, and never-frozen harbours; and it has been kept here by the skill and energy of the people, with their historic advantages of labour-supply, capital, and credit. The earliest centres were on the best falls, e. g. at Lowell and Manchester, still very important; but the rise of humidity south of Cape Cod favoured fine work, especially where the 'Fall Line' coincided with the head of the tide, e. g. at Fall River, where the river falls 130 ft. in about half a mile. The neighbouring towns of Taunton and the famous old whaling port of New Bedford have very similar positions, the latter making the finest calico in the country. And all these tide-water towns were relatively favoured as the expansion of the industry outran the available water-power, and coal had to be imported, as they were also by the climate[1] and easy import of the raw material.

The greatest development, however, has been in the Carolinas and Georgia, where the Fall Line is between valuable coalfields and rich supplies of raw cotton and home-grown food, and where the deficiency of employment in the broadest and highest part of the Blue Ridge (Black Dome = 6,700 ft.) led to a relatively abundant supply of White labour at very low wages. These people, however, have none of the personal and historic advantages of the New Englander, and produce only the coarse products which supply the limited exports of cottons—mainly for 'Native' use in Central and South America.

The distribution of the **wool** industry has a domestic rather than a climatic base. Unlike the cotton, it was originally a home industry, and therefore found everywhere; but places with good water-supply and easy access to the raw material had obvious advantages. This led to the concentration of the industry where the best sheep pastures of the early colonists had easiest access—climatic and commercial—to the sea, i. e. Philadelphia; and, with the evolution of the industry, the coalfield maintained it *in loco*, so that Philadelphia is still the greatest centre—specially interested in carpets. Eventually, however, the industry was bound to show the typical 'textile' sensitiveness to labour supply; and both quality and quantity were found in the great textile area. The industry now spreads over practically the whole region between the Susquehanna and the Androscoggin, but is specially developed in (*a*) Pennsylvania, and (*b*) Rhode Island and Massachusetts, the latter standing first for both worsted and woollen goods. As much of the raw material comes from Montana and Idaho, the industry may spread westward, e. g. to Cleveland, where the transcontinental railway traffic touches the lake in front of the fine sheep-pastures on the northern slope of the Ohio water-parting.

The **silk** industry is as narrowly concentrated as the wool industry is widely distributed, its great centre being New Jersey, though it spreads westward into Pennsylvania and eastward into Connecticut. The mass of the raw material comes from Japan and China, but the relative cost of transporting silk is so little (cf. p. xvii) that it has no influence on the location of the industry. Three things are important. Historically, the great metropolis of New York became much the best market for silk goods; as the great immigrant port, it has attracted a large influx of Italians, who supply much of the skilled labour; and these Italians were originally imported for the heavy mining work of Eastern Pennsylvania. This was work suitable only for men, so that there was a surplus of female labour such as is specially suited to silk-working. In Pennsylvania the silk mills are in or near the great coal-mining towns, e. g. Scranton (the 'Wigan' of America) and Wilkesbarre, and Pennsylvania stands first in the silk industry as a State; but the 'Lyons' of America is Paterson, on the falls of the Passaic.

Like wool, **leather** was a 'domestic' product, and therefore very widely spread; it is mainly associated in North America with the supply of hemlock and oak bark, with of course the fundamental 'hides' (of cattle and other large animals) and 'skins' (of sheep and other small animals). The United States is the largest maker of leather in the world; and, even in the palmiest days of its cattle and sheep raising, it imported an immense number of hides, mainly from the Argentine and other parts of the Americas, and skins, mainly from India (goat)—raw hides and skins being one of the easiest products in the world to transport.

Like the wool industry, the tanning industry in North America has been concentrated, but over belts rather than in spots. The northern belt runs from east to west; it is based essentially on hemlock, and associated with the hard old rock which lies between the latitudes of Quebec and Philadelphia and the longitudes of Newfoundland and Wisconsin. The other runs north and south down the Appalachians from Philadelphia, expanding into both Virginia and Kentucky. Here chestnut, as well as oak, has supplied tanning materials, the chestnut bark especially increasing in value with decrease of latitude, so that the percentage of tannin round Atlanta is more than double that round Philadelphia (14 : 6).

The relation of domestic animals to population, the valuable pastures of the cleared forests, and the position of the two belts of forest, combined to make Philadelphia the most important leather centre, as it still is; and in later times the discovery of chromium in several counties of

[1] Towns farther inland, especially in the lee of Long Island, tend to use their water-power in hardware industries, e. g. Waterbury and Hartford.

Pennsylvania and Maryland, the easy import of goat skins by sea, and the dense population, have maintained its supremacy even in these days of chrome tanning. But the port lacked the impulse given by the earlier stream of immigrants to Quebec and Boston to make its local supply of leather the basis of a great ready-made boot and shoe industry. The Boston centre, with its dense local population and its large market, had more opportunity for specializing, so that to-day Brockton makes men's and Lynn makes women's wear; but both the U.S.A. and the Canadian centres are feeling the western trend of population,—the railways, which originally centralized eastwards the widespread leather industry, now carrying the boot and shoe industry westwards, e.g. to Chicago.

North America grows several plants that yield **sugar**, e.g. sorghum and maple. Sorghum is grown—like other kinds of 'maize'—where sunny days are followed by warm, humid nights, e.g. in Kansas; the maple yields sap freely only where sunny days are followed by cold, dry nights, e.g. in the Lower St. Lawrence region. But the largest yielders of sugar are the sugar-beet and the sugar-cane. The former is a product of intensive agriculture, and—like the maple—confined to temperate climates; the other is at present a product of extensive agriculture, and—even more than the sorghum—confined to tropical climates. At present, too, the beet has the advantage of having had very much more scientific attention paid to it—though this very fact may presently favour the cane, which is now being properly studied. Of course, the cane is widely spread through the tropics as a 'domestic' plant, and the juice *can* be used raw, like the universal sweetener of olden times—honey; but, for commercial production, both beet and cane require very large extracting plant, both have very useful by-products which associate them closely with modern cattle-raising, both require a dry harvest-time, which is practically guaranteed by irrigation, and both favour saltish soil.

In U.S.A. the optimum July temperature for beet (70° F.) is found in several areas of peculiarly saltish soil, where, too, irrigation is not only normal, but largely associated with the raising of alfalfa for cattle, e.g. between North Colorado and South Idaho, with a natural centre at Salt Lake City. The Michigan area too, though not under irrigation, coincides with the vast Saginaw salt-field. And, though in early days the excessive demand for labour, especially for weeding, discouraged beet-growing in U.S.A. and Canada, the great inflow of Slav immigrants from beet-growing areas in Europe has entirely solved the problem in U.S.A.

But, while there are almost unlimited possibilities of expansion for the beet, the cane area is likely to contract. Even in Florida frost is possible, and in Louisiana it is certain, so that the area, the number of cuttings in the year, &c., are all limited; and there are other difficulties, e.g. tariff changes, scarcity of labour, and the nearness of the West Indies (cf. p. liv). Indeed, in U.S.A. cane is both climatically and economically 'on the margin'.

Appalachian Region: Orographical.

P. 42[A]. A comparison of this map with a geological map of the same area would draw attention to the essential foundations of commercial development in the region. For instance, four different types of sea-coast tap **Chicago**: (*a*) the fiords of the depressed glacial peneplain of the north-east, where the coast is so much broken as to be almost 'incoherent' commercially except in the great St. Lawrence valley; (*b*) the upraised sea-floor of the south-east, where the fertility of the interior has justified expense on artificial ports; (*c*) the delta deposited by the Mississippi under conditions which are still active, and adverse—without enormous expense—to the development of the river and canal route to Chicago; and (*d*) the pivot-gap between the depressed north-east and the upraised south-east where all the rivers get out—between Norfolk and New York—at sea-level.

The old crystalline uplift of the Eastern Appalachians is *not* the **great commercial barrier**, therefore; nor, on the other hand, is the Great Valley made less useful by the fact that it is not the single trough of a master river, but only a succession of minor valleys—of Hudson, Delaware, Susquehanna, Shenandoah, Tennessee, &c. But the Alleghany plateau, in spite of its newer sedimentary rock and greater fertility, is a real barrier, for everywhere it has a steep eastern scarp which all railways must climb unless they use the Mohawk valley. Thus, while the three great 'Lake' railways have summits ranging from *c.* 500 feet on the *New York Central* to 1,400 on the *Erie* and 1,750 on the *Lehigh*, the four 'Ohio' lines must all climb at least 2,000 feet, as the *Pennsylvania* and the *Chesapeake*; and the *Norfolk* climbs 2,200, and the *Baltimore* 2,300.

Chicago, as the 'epitome and climax of lake and prairie', is the natural objective, the political and economic control being of course based on the physical and climatic. The city owes much to the enforced convergence of the railways on the southern apex of the **Great Lakes**, for the main route to them has been by neither of the obvious lines of least resistance—the St. Lawrence and the Mississippi. The closing of the ports in winter would have been final even if the upper and lower parts of the St. Lawrence basin had had identity of political and economic interest; but the traffic on the lakes is gigantic, the tonnage through the Soo (Sault Ste. Marie) canals being more than four times that through the Suez Canal, and increasing rapidly (e.g. over 3,000,000 tons in 1913).

The physical history of the lakes is bound up with the old blocks of Minnesota, Wisconsin, and Michigan, which dammed back the great ice-sheet, and which are characteristically rich in metal, as the younger flanking strata are in coal. Climatically, they give a timber fringe to the agricultural prairie, and help to decide the meeting-point of wheat and maize. Chicago stands between metal and fuel, timber and agriculture, at the meeting-point of the two grain-belts. The total value of its manufactures in 1913 was nearly £412,000,000, and that of its total wholesale trade was over £480,000,000.

Railway Map.

Pp. 42[B]–42[C]. This map, if compared with others of the same area, e. g. of Natural Vegetation and Population (p. 40), Industrial Products (p. 42), Commercial Regions (p. 43), is an adequate base for a survey of the **railway** geography of the continent. Obviously, the eastern half has much greater facilities for transport both internally and externally, by water and by land—the waterways having dominated the whole position down to 1850. Much the most important single section has been the route along which the Erie Canal was built in 1825; and much the most important single point is Chicago, though very important junctions have sprung up where the great lines touch or leave the lakes, e. g. at Milwaukee, Toledo, and Buffalo. The latter is the eastern limit of 20-foot navigation, as the Welland Canal does not carry more than 14-foot boats. There is, of course, an important direct line between Boston and the Mohawk valley via the Houssac tunnel; but it cannot compare with the Hudson valley route, nor even with the Pennsylvanian line which connects Chicago with New York via Pittsburg and Philadelphia.

The congestion and consequent delays on the eastern railways, the opening of the Panama Canal, and the advantages of the Mississippi river itself, must move the centre of political and economic gravity westward; but, as the Great Lakes are perched actually on the secondary water-parting of the continent, they must be the pivot. Obviously, however, they can be approached with almost equal ease from either north or south; and while in the east the advantage lies with the central avenue of approach, i. e. the Mohawk valley, in the west the narrower span of the Cordilleras and their lower altitude favour the northern and the southern avenues. The northern avenue, again, has an advantage over the southern in its freedom from desert; but this is perhaps compensated by the combination of water and rail, for the *Southern Pacific*—with the minimum transcontinental distance between San Diego and Galveston—ships much of its San Francisco traffic direct from Galveston or New Orleans to New York. It commands also the only easy railway routes into Mexico, for the coastal lines from Tampico, Vera Cruz, and Manzanillo have to climb a steep and high scarp.

This is another illustration of the tendency, already noticed in connexion with the Baghdad and Cape-to-Cairo 'lines', to combine **rail and water** transport over long-distance routes; and it emphasizes the relative insignificance of the transcontinental railways for really transcontinental freight. No doubt, a great deal of fruit and fish, of tea and silk, is carried by train from the Pacific coast right across the continent; but the great transcontinental lines, like the *Trans-Siberian*, are too long for really transcontinental freight, and live essentially on what may be called semi-continental freight. This, again, favours the northern lines, and encourages such enterprises as the construction of a line to Hudson Bay. Cf. p. xxi.

For this great inland sea is actually nearer than Lake Superior to the wheat centre of **Canada**, and Fort Churchill or Port Nelson is nearer than New York to Liverpool; it is free alike from fogs and storms, icebergs and shoals; under 500 miles of railway are needed; and the route lies through useful timber and mineral lands. The Hudson Strait is only open from about mid-July to the beginning of November, but that would allow the shipping (in August) of a large balance of wheat from the previous harvest, and the shipping (in October) of a large proportion of the new harvest. This would relieve all the present congestion, and greatly reduce rates; and, with the opening of a Georgian Bay canal (with a 22-foot waterway, carrying 12,000-ton vessels) it would give Canada an unrivalled position in the wheat market. Already, Winnipeg is *at least three times* as important as Chicago in the receipt of wheat; and Minneapolis, the only town that approaches Winnipeg in importance, does so essentially as a flour-milling rather than a wheat-shipping centre. So the twin ports of Port Arthur and Fort William, with a shipment of 200,000,000 bushels, were far above Buffalo and still farther above Duluth-Superior.

The position must also be affected by the opening of the Panama Canal, because a Great Circle from Panama to Shanghai skirts the British Columbia coast; and the Canadian lines have shorter distances at a high level, lower summits, and fewer stiff climbs than the U.S.A. lines. The *Grand Trunk Pacific* is specially favoured by the highness of latitude[1] and the lowness of its summit, the Yellowhead Pass being only 3,700 feet. Farther north still the little Skagway railway taps a waterway which, in physique, is almost without rival; for the Yukon rises on the Dyea Pass within 15 miles of the tide at Dyea; it becomes navigable at Lake Bennett, i. e. within 15 miles of its source; and, except for 3½ miles at the Cañon and rapids, it is navigable in summer for the whole 2,500 miles down to the Behring Sea.

San Francisco has a good local hinterland, rich in oil, mercury, and gold, in fruit, grain, and wool; it has a monopoly of several hundred miles of coast, and is a convenient terminus for the Pacific cable; and it is a natural focus for the Willamatte, 'Humboldt', and San Joaquin valleys. But its non-local hinterland is contracting, foreign trade preferring the Puget Sound ports and eastern trade trending to Gulf ports; it has no coal; and its position on a line of weakness (in the earth's crust) which gave it the Golden Gate, as a similar line of weakness gave to Basel the Burgundy Gate, renders it, like Basel, liable to seismic disturbance.

New York, as an island site, had historically maximum facilities for defence and maximum proportion of coast to surface, but must also be economically hampered by bridges, tunnels, and 'sky-scraping' buildings. Nearer Europe than either Philadelphia or Baltimore, and nearer the interior than Boston, it was also more central on the east coast;

[1] A degree of longitude in the latitude of Prince Rupert is only *c.* 40 miles; and the C. P. R. has, in the Crow's Nest Pass, though not in the Kicking Horse Pass, a summit lower than that on the *Great Northern* (U.S.A.).

but it had no proper local hinterland, and has had to depend always on a non-local one. This has been guaranteed by the unique value of the Mohawk-Hudson valley and waterway—compared especially with the barrier of the Berkshire range.

Vegetation Map.

P. 42[D]. The names of the Commercial Divisions here are, of course, not exclusive; but they do give the dominant note. For instance, the importance of wheat in the central prairies is due mainly to the fact that the huge maize crop is largely fed to stock; so the importance of cotton is largely due to the fact that it is somewhat of a monopoly, and is grown where export by sea is naturally easy. The wheat is an inland crop, fighting against foreign competition and dependent on railway transport. The cotton, again, has an artificial superiority to maize even in the Cotton Belt, for there is far more land under maize; but cotton is the 'cash' crop, with an area as large as England and Wales and a value of £150,000,000!

Economic Map.

P. 43. Comparison with the map on p. 42[D] will show that the great **wheat**-belt is devoted partly to spring wheat and partly to winter wheat, the latter where the winter is not too cold or has sufficient snow to make a good cover for the young plant. The whole prairie belt, from south of 35° N. to north of 50° N., is on the margin of the 'arid', its western edge coinciding with the isohyet of 20 inches; and the use of durum wheats (very glutinous and drought-resisting) dry farming, and irrigation are moving the margin westward.

The continental heating and cooling, with the resultant early summer rains and late summer drought, are favourable in the spring-wheat area; but the amount raised there depends still more on the unique facilities for cultivation by machinery and for transport by rail and lake. In this area, too, the continuous 'pioneer' cropping of wheat—so characteristic of the southern farms, e.g. between Fort Worth and Wichita—is giving place to more scientific farming, with a resultant larger yield per acre. The continuous cropping, however, is also found in the extreme north-west (Alberta and Saskatchewan); but the virgin prairie there gives a higher yield, not only than the somewhat exhausted (for wheat) soil of the 'glacial' plain in the Red River valley, but also than the Texas prairies. And a certain unity of interest is given to the whole belt by the latitudinal succession of harvests, the commencement of harvest varying even in the winter-wheat area from June 1 to July 15.

In the other areas different conditions prevail. For instance, rotation of crops involves a good deal of wheat even in the least likely districts, e.g. Maine having a higher yield per acre than the Dakotas; again, geographical inertia encourages its growth in places where very strong foci originally sprang up, e.g. where the Erie Canal and the Genesee Falls gave Rochester its important milling industry. In Washington and Oregon a very tenacious lava soil in the lee of the Cascades gives sufficient moisture in an almost rainless summer—conditions very favourable both to the quality and to the easy harvesting of the crop. On the other hand, where the climate is really most favourable, i.e. in California, fruit and alfalfa are displacing wheat.

The pink area refers to what is known specifically as 'the **Corn Belt**', between longitude 83° and 97° W. and latitudes 39° and 43° N.; but the distribution of maize is much wider than this. It is related specially to dairy work in the east and meat-production in the west-centre, while in the 'Cotton Belt'—where the heat is too continuous for large yield or the best quality—it is largely used both by Whites and Blacks as the chief breadstuff. As with wheat, the highest yield is in the north-east, where scientific farming depends on rotation, where the rough ground is no serious obstacle—as it is to the growing of 'small' grains, and where the cooler latitude and altitude check its ripening as grain and encourage the secretion of 'milk'. This implies, of course, the use of the silo, but gives the silage a maximum feeding value.

Even in the Cotton Belt only a fraction of the land is under **cotton**; but scientific farming—with its relation to crop rotation, stock-raising, and breeding of early-maturing[1] cottons—is likely to extend the proportion both inside and outside the belt. Florida is too cloudy for cotton-growing, and even Georgia is rather cloudy for 'Upland' cotton; while Louisiana is specially devoted to rice and cane-sugar. Once the crop had become a machine crop, the cheap and fertile land, with the suitable climate and suitable labour, gave the Gulf States a practical monopoly of the market. Texas, owing to its rich 'Black Prairie' and its large area, is the largest producer, feeding the port of Galveston; Georgia, with the neighbouring parts of South Carolina and the very fertile 'black' limestone valley of Alabama, raises both 'Upland' and 'Sea Island', feeding such ports as Charleston, Savannah, and Mobile; and the third great area is the Mississippi 'Bottoms', especially between Vicksburg and Memphis. The latter town, on the margin of the Corn Belt, i.e. really a cattle-finishing belt, is specially interested in the oil industry, the cotton-seed used for 'cake' alone being valued at nearly £30,000,000 a year! In spite of the huge output of cotton, there is a large import into U.S.A.—almost entirely of Egyptian fibre; but efforts are being made to grow similar fibre under 'Egyptian' conditions on the Colorado delta. At least three-quarters of the Mexican cotton crop is already grown as an irrigation crop in the neighbouring arid north-west of Mexico.

Tobacco-growing, especially since the introduction of shading (by cotton sheets), has become, like beet-growing, a branch of intensive agriculture; and it is, therefore, better adapted to the Eastern States. Its quick-ripening habit accounts for the plant being able to grow in relatively high latitudes, e.g. in Wisconsin, New York, Pennsylvania, and Connecticut; and the yield in the two latter areas is exceedingly high, partly because of the very skilful farming

[1] The main motive is to have the cotton ripe before it is attacked by the boll-weevil.

and partly because the once-forested limestone gives an ideal soil. The largest amounts, however, come from the flanks of the Appalachians between 35° and 40° N., with Louisville and Richmond as the two great markets. The development in the Carolinas is mainly in connexion with a very important manufacturing industry (cigarettes, snuff, &c.) for export in tins, e.g. at the old *fruit*-tinning towns of Winston and Durham. Smaller, but important, tobacco areas are found in Louisiana and Florida; and the latter will probably become very important, for the 'Gulf-Stream' climate of its forested limestone resembles closely that of the Pinar del Rio district of Cuba. The latter, however, has a special asset in the shelter given by the Organos ridge to its sunny southward slope.

The distribution of **gold** is relatively unimportant. On the one hand, gold-mining is essentially an unreliable, if not actually impermanent, industry—the output in California having dropped from £16,000,000 a year in 1850 to £4,000,000 in the present century, and that of Klondyke having risen from £400,000 in 1897 to £4,400,000 in 1900, only to fall to £600,000 by 1907. On the other hand, its great value in small bulk and the consequent ease of transport make it a valuable economic impulse in such adverse physical and climatic conditions as those of the Cordilleras and Alaska.

Not only is there a vast area of **coal** in **U.S.A.**, but its development is so recent that probably not 1 per cent. of the total amount has been extracted nor a depth of 1,000 ft. reached. Its quality varies, like its historic development from east to west, with the decrease in geological disturbance—the small (500 square miles) anthracite field being the most valuable, while west of 100° W. the deposits are mainly Cretaceous, and west of 115° W. and south of 33° N., mainly Tertiary. The latter, however, is not all poor, quite good coal being found in the north-west, especially in Washington; but in the Gulf States it degenerates into very poor lignites.

The Cretaceous is found only as lignite in the Dakotas, but improves with increase of disturbance in the rocks, e.g. being quite good in Colorado; and its utility has been in proportion to the richness of the metal deposits.

The real Carboniferous fields are in five areas—the Western Interior stretching from Texas to Iowa (widening northwards), and the Appalachian stretching from North Pennsylvania to Central Alabama (also widening northwards), while two blocks occupy respectively the Michigan peninsula ('Northern Interior') and parts of Illinois, Indiana, and Kentucky ('Eastern Interior'), the Kentucky seams providing excellent coke. Otherwise this Eastern Interior coal is inferior to the Appalachian, but it is exceedingly useful in the 'Chicago hinterland'. In the Appalachian area the greater width, the older development, and the Ohio waterways, make Pittsburg the natural metropolis. In West Virginia the later development—due to greater difficulty of access—favours rapid output now, and the excellence of the neighbouring 'Pocahontas' fields in Virginia led to unique railway facilities for export, e.g. to New England, via Newport News, Norfolk, and other points round Hampton Roads. In Alabama the Birmingham field has also very easy access to the sea[1] via the improved Warrior River.

The fifth, the anthracite field—with its four basins, represented by Scranton, Wilkesbarre, Pottsville, and Harrisburg—has at least equally good transport; but even here there is difference of quality and in the proportion of marketable coal, which sinks from *c.* 80 per cent. in the north to *c.* 70 per cent. in the south. The anthracite output, however, is only *c.* 18 per cent. of the total, of which Pennsylvania claims nearly half, Illinois having just one-tenth and West Virginia slightly more than one-tenth. The Pacific coast is the only area which really suffers from want of coal, and even there the north is not concerned; and in the south the difficulty has partly disappeared with the discovery of the rich oilfields.

In **Canada** the coalfields are also of different ages, but the most productive are not in the areas of densest population. The Nova Scotian field is the most important, especially at Pictou and Sydney, and has the great advantage of being on the sea and close to iron—local and in Newfoundland (Wabana); but even here peninsular isolation from the Dominion and political isolation from New England have hampered the economic development. On the other hand, the Cretaceous coals of the north-west are relatively much more important than the similar coals in U.S.A., because of their use for domestic fuel, farm machinery, and railways, in the part of Canada which is growing most rapidly both in population and in importance. In 1913 some 4,000,000 tons were raised; and, though it is mainly lignite, it improves, as in U.S.A., with the physical disturbance, becoming good bituminous coal at the foothills of the Rockies, e.g. at Lethbridge (cf. the station of *Anthracite* on the C.P.R. between Calgary and the Kicking Horse Pass). The Alberta coal lies in two main areas, the valleys of the Belly and the Peace rivers; in the former it is very useful to the C.P.R., and in the latter to the wheat-growing population which is spreading north between Edmonton and Dunvegan. On the British Columbian coast there is even better distribution, for the G.T.P.R. terminus is close to the Naas anthracite, while the C.P.R. and C.N.R. have their termini opposite the rich and very accessible deposits of Vancouver Island.

The general distribution of **iron** is at present of less importance than (*a*) its accessibility, and (*b*) the quality of coke. In the one case Pennsylvania, especially the Connellsville district, has a marked advantage; in the other case the Lake Superior region is supreme, with such famous centres as the Marquette and Menominee, the Mesabi and Vermilion ranges, with shipping ports at Marquette and Escanaba, Ashland and Duluth.

The **petroleum**, except from the very valuable wells in the Santa Barbara region of California, is largely associated with the real 'Carboniferous' coalfields, being found in a wide belt along the western, i.e. 'bituminous', flank of the Appalachians in Pennsylvania, Ohio, and West Virginia. A parallel belt runs south-westward from the foot of Lake Erie, and includes Illinois, which is now three times as productive as any of the three old centres (Pennsylvania, Ohio,

[1] In 1913 some 4,000,000 tons were exported by sea, the customers including France, Italy, and Egypt.

and West Virginia); and along the edge of the Western Interior coalfield there are several important areas, especially in Texas and Oklahoma—the 'successors' of Kansas and Louisiana. Similar fields fringe the Cretaceous lignite in Wyoming. Till recently the great yields had been in the Alleghany valley of Pennsylvania and in the Beaumont corner of Texas; but these have been left far behind by Oklahoma and California, the latter now yielding double the Pennsylvania maximum (33,000,000 barrels in 1891). Changes in output are very rapid, for a well often does not last more than seven or eight years; but these two great reservoirs have, in the meantime, revolutionized the transport problem across the southern Cordilleras, and given a remarkable impulse to industries. Both the oil and the gas which so often accompanies it, are taken in pipes to the various ports, e.g. Port Arthur (Texas).

South America: Physical and Economic.

P. 44. With five-sixths of the continent in the tropics, latitudinal types of climate are limited. Lowland temperatures in the tropics are not very high because of the vast expanse of Selvas, but the continuity of high temperature and the high humidity implied in the Selvas are very trying to man and very favourable to dense vegetation (cf. the constant 'spraying' of railway tracks to keep down weeds). The highest average temperature is in Paraguay (104° F.), and the greatest extremes are in Argentina; the distribution of rainfall emphasizes the fact that the great mountain system is *on the lee side* of the continent.

The January map illustrates (*a*) the concentration of convection and relief rains on the Titicaca 'elbow', with its great peaks of Sorata and Illimani, and (*b*) the drying influence of the Trades over the llanos, which get their rain only in the July calms (cf. p. viii). On the Colombian coast, however, even in January the S.E. Trades, as S.W. Monsoons, bring some rains.

In July, with the sun and the low-pressure focus north of the equator, there are heavy convection rains all over the north of the continent—the S.E. Trades give relief rains in Brazil, and blow as strong S.W. monsoons to the Colombian coast—the N.W. Anti-Trades are far north in Chile, and their cyclonic storms and the N.E. winds off the Atlantic high-pressure system bring useful rains to the eastern half of the Plate basin.

Comparison of the Climatic maps with those of Orography and Vegetation draws attention to the combination, in the Amazon basin, of low level (three-fourths being under 600 feet), of equal days and nights, of vast expanses of swamp, in producing a very even temperature and so favouring such plants as rubber. The isotherms face north when the sun is north, and south when the sun is south, but the temperature remains at *c.* 80° F. alike in January and in July. Outside the Amazon basin, on the other hand, the prevailing 'association' is grassland, for both temperature and rainfall vary greatly, the warm Brazil current carrying its influence far south in winter, while the cold Humboldt current is felt right up to the Peru coast (cf. the Benguela current). This cold current, in the lee of the great mountains, influences the distribution of desert (with its nitrates and guano) and of fog—even off the Lima coast. So, the pampa reflects the lowness of the narrow Plate trough between parallel belts of upland.

The Political maps show how adverse climate has been to density of population and to multiplication of political units in the eastern half of the continent. The commercial advantage of facing the Atlantic has been, therefore, minimized till quite recently; and even now the mass of the eastern population is south of 20° S. Latin America is still 'young', however, and therefore in the experimental stage—politically and economically; and its future probably lies with the Mestizos, who must be regarded no longer as 'half-breeds', but as a self-contained type resulting from the mating of Spaniards—on equal terms, i.e. from comparable stages of civilization—with the 'Inca' type.

Politically, large areas of varied relief or climate, e.g. Brazil and Argentina, tend to be federal, and both of these had historic divisions (provinces). But, while Brazil has four drainages and great contrast of tropical Selvas with semi-tropical savana, Argentina has a marked physical unity and a single outlet, so that—though government is federal in theory—it is largely centralized in practice. Small areas of small population and of uniform relief and climate, such as Uruguay and Paraguay, are central. Areas with great variety of relief and climate, but with very small population or with a large proportion of Amerinds, such as Chile and Bolivia, Peru and Ecuador, are central. Colombia and Venezuela sum up the whole position. Both have great variety of relief and climate, and were settled early: but, while Venezuela changed from central to federal as a natural sequel to the wholesale decimation of Amerinds and to variety of outlet—by the Orinoco, La Guayra, and the Maracaybo Gulf, Colombia changed from federal to central as a natural sequel to the universality of Spanish as the tongue of the Mestizos and Amerinds and to the unity of outlet by the Magdalena.

Though isolated and compact, with an even and often unhealthy coast, i.e. with few harbours, South America, as a typical Atlantic hinterland, has great advantages for commerce—in three great rivers, low divides, and its great mountains far to leeward; but its chief exports are very significant, e.g. Argentina sending 2,700,000 tons of wheat, 1,300,000 of maize, and 200,000 of meat; Brazil, 700,000 of copper and 170,000 of manganese; and Chile 1,500,000 of nitrates. For the quantity, quality, and conditions of labour are varied. The total population of the whole continent is only 45,000,000—15,000,000 being Whites, 13,000,000 Mestizos, 9,000,000 Amerinds, and 9,000,000 Negroes and Mulattoes, these two being particularly confined to the area originally given by the Pope to Portugal, i.e. east of 60° W.

There is an enormous area over which high-priced natural products such as rubber and yerba maté are found ready to hand, under conditions where they can be easily exploited commercially if the necessary industrial labour can be provided. But the Population map shows that such labour

must be imported; and in these distant and unhealthy regions only a very low type of labour can be got, and that at high cost, and it is exceedingly difficult to handle.

Again, it is practically true that the Pacific hinterland specializes in mineral exports, and the Atlantic hinterland in vegetable and animal exports. The vegetable products, however, may be classified as (*a*) plantation products, e.g. coffee, cacao, and sugar, in the north and east, e.g. from Cartagena, La Guayra, Demerara, Rio, Santos; (*b*) jungle products such as rubber, in the north-east, e.g. from Manaos and and Para; and (*c*) pampa products, such as grain and meat, in the south-east, e.g. from Rosario, Buenos Ayres, Montevideo, and Bahia Blanca. And it is significant that a number of these ports are political capitals, their sites contrasting strongly with those of the western capitals, which are up on the healthy plateaus; and, as access to their unhealthy Pacific ports is very difficult, exports have been minimized. But tropical medicine and the Panama Canal, with modern railway engineering, will change all this. For instance, the voyage from New York to Guayaquil will be reduced from 11,500 miles (*c.* sixty-seven days' sailing) to under 3,000 (*c.* nine days).

South America: Economic.

P. 46. The distribution of the **coffee** is essentially montane, but the conditions in the Cordilleran and Brazil areas are by no means similar. In the Cordilleran areas coffee is one of the few products suited to the so-called 'eternal spring' and easily transported (by mule) from the healthy plateau across the steaming lowlands to the isolated ports. In Brazil the sunward slopes of the maritime Serra do Mar give a huge area of rich red soil easily accessible from the Atlantic, with an average annual temperature in São Paulo of 65 to 70° F. The latitude is too far south for equatorial convection rains, so that weeds are not greatly encouraged in summer, and the Trades bring a dry winter for harvesting and drying; at the same time, being at the outer edge of the hot belt and at a height of up to 2,500 feet, the plantations are practically safe from frost. The output supplies over 70 per cent. of the world's needs, but the quality suffers from (*a*) the vastness of the estates and the consequent 'overseer *v.* absentee-landlord' system, and (*b*) the poor labour of the (more or less recently freed) negroes. With the introduction of Italian labour and the use of improved machinery[1] the quality is being much improved.

The distribution of the **cacao** illustrates the three great needs of the cocoa tree: (*a*) a low level, (*b*) a humid atmosphere, and (*c*) an absence of wind. It is, therefore, a 'Doldrums' product, e.g. from the steamy lowlands of Ecuador ('the Equator State') and the Lower Amazon. But it can be grown up to the margin of the hurricane belt, e.g. in the steamy Magdalena valley or behind the maritime Cordilleras of 'Venezuela'—which practically includes Trinidad.

The map illustrates the absolute dependence of such a jungle product as **rubber** on the navigable rivers—which are navigable from the Atlantic right up to the Cordilleras, e.g. to within 300 miles of the Pacific; and the future of 'Para' rubber in the Selvas depends on the regulation of these rivers more than on anything else, for the jungle is *too dense* for proper exploitation, and there is no supply of good labour such as the Malay area enjoys. The patch behind Ceara is very important, therefore, because it marks the growth of 'Manihot' rubber on arid, i.e. relatively healthy and accessible, uplands.

The distribution of **silver** in South America is, like that of opium in south-east Asia, of more historic than economic interest; but it does illustrate (*a*) the old importance of a product with great value in small bulk over a dry and rugged country accessible only by mules, and (*b*) the importance of a precious metal in promoting railway extension in modern times.

The Cordilleran **wool** is drawn from the llama and the alpaca as well as the sheep, but the Plate and Patagonia products are entirely from sheep. The growing output from the dry rugged Patagonian platform must be associated with (*a*) the föhn winds from across the Andes, (*b*) the easy export by a relatively crowded Trade-route, and (*c*) the enterprising character of the British farmers, largely from the windy sheep-paradise of the Falkland Isles. In the Plate region there is a mutton as well as a wool problem, and the denser distribution of the sheep is over the drier and rougher land away from the rivers; and, though Argentina has much the larger area, Uruguay, with her better rainfall, has much the denser distribution, e.g. over 360 per square mile as against only *c.* 60, and over 25,000 per 1,000 of population as against under 10,000.

The Plate basin is still more favourable to **cattle.** They can be raised and fattened out of doors without shelter or (usually) shade; land and labour are cheap; and there is an abundance of alfalfa and other excellent food. When it becomes necessary to fatten them on maize, too, the land is rich in that grain. The great distances led in early days to the export of only choice bits, e.g. the tongues—in tins; but railways and refrigerators have made Argentina now the chief source of fresh beef, e.g. one-third of the Christmas beef in London coming from the Plate. The pampa-grass region feeds 80 per cent. of the beasts, distributed—in the order of importance—in Buenos Ayres (over 10,000,000), Corrientes (over 4,000,000), Santa Fé and Entre Rios (each over 3,000,000), and Cordoba (nearly 3,000,000); and the export has risen from *c.* 2,500,000 cwt. in 1905 to well over 6,000,000 cwt. in 1911. In the meantime, too, the population is not increasing fast enough to encourage the keeping of 'milk' type rather than 'beef' type; and the Spanish or Gaucho labour (unlike the British labour on the sheep ranches) is neither inclined nor competent to make butter and cheese in such a climate. At the same time, the population is increasing, and grain-growing is becoming relatively more profitable.

Central America and West Indies.

46[1]. In general relief, and still more in climate, the isthmian and the insular units here have considerable

[1] The plant is very expensive, which favours large estates. Cf. p. xvi.

similarity, and so considerable community of product and economic interest; but while the isthmian units suffer from the political and economic instability which has been so typical of Latin America, the insular units have acquired a 'European' stability. Similarity of aspect, too, has different results in the two areas. In both, the best harbours and the mass of the population are found in the lee of the Trades, i. e. to westward; but in Central America this implies the contrast between Atlantic and Pacific hinterlands, and consequent isolation of the population from European influence and commerce. Even the first transcontinental railway and the first transcontinental canal take their names from Panama, not Colon (Aspinwall), as on the drier coast. And the heavy rains of the relatively wide Atlantic plains are reflected in the dense forests which help to isolate the savana uplands of the narrow Pacific slope.

This slope is characteristically volcanic, which accounts alike for the rich soil, e. g. in Salvador, and for the rejection of the Nicaraguan route for the canal, though its great merit—the possession of lakes *in situ*—has been copied by the erection of an artificial lake (L. Gatun) on the Panama water-parting.

As the equator of heat is always north of the mathematical equator, and this region has no period of drought, vegetation is greatly encouraged; and the limestone plains are as favourable to tobacco or sugar as the volcanic gorges are to cacao or the savana uplands to cattle. Except in Honduras and Panama, coffee has been the great isthmian crop, as sugar has been the great island crop, and large crops of both are still raised; but bananas are now becoming of prime importance in both areas, especially on the Atlantic coastlands of the isthmus—productive hitherto of little except cabinet and dye woods, e. g. mahogany and logwood, which could be exported by the rivers.

The character of the island crops has been dependent to a considerable extent on the Negro labour—which is both naturally inefficient and relatively unsuited to high altitudes, e. g. in San Domingo. These conditions have accentuated the difficulties caused by the emancipation of the Negroes, especially in connexion with such a typical 'coastal-lowland' crop as **cane-sugar**. But Cuba still ranks next to India in the production of cane-sugar, and Trinidad, Barbados, and Jamaica are also large producers—both Trinidad and Barbados having particularly favourable altitudes. All the Caribbean coastlands over which the Trades blow, grow fine sugar; and the industry has been much encouraged, especially in Puerto Rico, by the admission of sugar into U.S.A. free of duty. The spread of railways, allowing the centralization of the crushing in factories, has been still more important, especially in the Matanzas and Santa Clara provinces of Cuba.

The essential difference between the sugar and the **tobacco** is in the unit of area, for the latter does not require the extensive grounds necessary to the growth of the cane; indeed, only small units guarantee the personal vigilance and patience required, although the use of cheese-cloth tents has greatly reduced the risk of injury from winds, downpours, dust, and even insects, while the shrubs grow larger and the leaves are smoother than when grown in the open. The new method is by no means confined to Cuba, very fine leaf being grown by it in, e. g. Jamaica and St. Kitts.

The elevated plateau of Guatemala and the valleys of Salvador, Nicaragua, and Costa Rica, with their rich volcanic soil, specialize in **coffee**, the finest quality coming from the highest and narrowest area, i. e. Costa Rica, where the coffee railway from Lima to Punta Arenas via San José climbs to a height of 5,000 feet. The famous 'Blue Mountains' coffee of Jamaica occupies a similar site to leeward—of the Trades, but the supply is just as small as that of the inferior 'Hispaniola' coffee is large.

The natural limits of the **cocoa** are south of the hurricane belt, so that Colombia, Venezuela, and Trinidad have special advantages; but the intricate relief of the inner or mountain (*v.* outer, coralline) line of the Lesser Antilles offers any number of the secluded windless valleys, with rich volcanic soil, such as the plant needs; and horticulture is more suited than agriculture to these smaller islands.

Amongst minor products are fruit and cotton [1] (cf. p. lix) and the valuable oil of Trinidad. The fruits include the pineapples of the Bahama coral—where the warm water is also very favourable to sponge, the limes of Montserrat, and the oranges of Jamaica; but the special product is the **banana**. Here again areas outside the hurricane belt have an advantage (cf. the banana trade of Port of Spain and Santa Marta, Boca del Toro and Limon), and the opening of the Panama Canal will give a further impulse to the trade. But the banana, like the cocoa, can find sheltered homes in almost all the mountainous islands; and Jamaica, commanding the Windward Passage, has developed a very large trade in bananas (valued in 1911 at £1,500,000), Port Antonio having a specially favourable position for export purposes.

The Atlantic Ocean.

46[B–C]. Direction being of prime importance here, a Mercator's Projection is used in spite of its distortion of areas and outlines, especially as the evil of this is minimized by the latitudes of the really important routes. The oceanic water-parting is inserted to draw attention, especially in America, to the enormous advantage of an Atlantic over a Pacific hinterland (cf. p. iv); and of course the water-parting in Africa is not necessary in this connexion, as it only divides Atlantic from Inland drainage, not Atlantic from Indo-Pacific drainage.

The map should be carefully compared with (*a*) the various Population maps, to show how far the great routes have equal populations at both ends, and (*b*) the various Product maps, to see how far equal quantities of freight may be moving in both directions, or varied needs may exist at opposite ends. Obviously the two great foci are the English Channel and the Pivot Gap of North America (cf. p. xxxviii); and, if the map showed sailing as well as steaming tracks, special attention would be drawn to the Azores and Cape San

[1] Especially from St Vincent, Barbados, and Grenada.

Roque. The Equator in the west of the Atlantic was as familiar to the old skippers as the Equator in the east of the Pacific was strange, for the one was the most important of all Trade-wind foci, while the other was in the widest belt of calms in the world; and the new canal, if successful, will practically reverse that for steamers.

The North Atlantic route is the most important of all routes because of its shortness, its freedom from physical obstacles, and the presence of good coal on both sides; but it has such a wide connexion with the Arctic that there is grave danger from ice in late spring and summer. The importance of this becomes obvious from a glance at a globe; for a Great Circle route from Liverpool to Panama hugs the American coast from Newfoundland to Florida, passing close to such important coaling stations as Halifax and Norfolk.

In the South Atlantic, Great Circle routes would practically always risk Antarctic ice, and on neither side of the ocean is there coal; but the direct route southward to the Horn from Europe is *coastal* south of Cape San Roque, touching such important harbours as Pernambuco and Bahia, Rio and Santos, Montevideo and Buenos Ayres.

The shape of the African coast, the character of the African exports, and their comparative paucity or recent development in low latitudes, make the Good Hope route as unfavourable as the Horn route is favourable; and, while this favours the Suez Canal, it will not favour the Panama Canal except at the expense of South Africa, for at present U.S.A. traffic to Australia, like freight traffic from Western Europe to Australia, goes via Good Hope. On the other hand, the Atlantic coast of South America has such an abundance of heavy cargoes out that cheap coal comes in almost everywhere.

The Central American section of the Atlantic will, of course, become much more important; and special advantage should accrue to Jamaica as commanding the New York-Panama route via the Windward Passage, St. Thomas (once British and with English still as its trade language) as commanding the Europe-Panama route, and Trinidad as commanding the Brazil-Panama route. To all Pacific ports north of Panama on the west coast of America the canal saves well over 9,000 miles from New Orleans, well over 8,000 from New York, and about 6,000 from Liverpool; to ports south of Panama on the west coast of America the saving must vary—from about 1,500 miles to Valparaiso, to nearly 3,000 for ports near the Tropic, and about 5,000 for ports near the Equator.

At present the Suez route forms part of the Atlantic sphere, with abundance of coal at both ends and an unlimited supply of heavy cargoes out—encouraging cheap coal in; but the Panama Canal will make some changes in the Suez traffic. New York will still be only 8,000 miles from Bombay by Suez as against 15,000 by Panama, and only 10,000 from Singapore as against nearly 13,000; but it will be scarcely 11,000 from Shanghai by Panama as against 14,000 by Suez, only 10,000 from Yokohama as against 15,000, and only 10,000 from Sydney, N.S.W., as against 13,000. Indeed, the favoured area under the new conditions will be in the longitude of Yokohama.

East Indies: Economic.

P. 46[D]. Wallace's Line divides Asiatic from Australian flora and fauna. For instance, out of 365 Asiatic kinds of birds found in Java and Borneo *only ten* were found in Celebes; in Bali there were no opossums or eucalyptus trees, while in Lombok there were no monkeys or bamboos.

As in the West Indies, most of the islands are mountainous, but have low coastal plains; relief modifies temperature, and latitude influences rainfall. They are more volcanic than the West Indies, have less proportion of coral, and—except for the Philippines—are outside the hurricane belt. Commercially the whole area is dominated now by Singapore, as once by Batavia; and politically Singapore is practically the capital of a British Malay empire which includes Borneo.

Tin, because of its rareness, is everywhere an important metal, but specially so in this area, which supplies more than 60 per cent. of the world's output—the Malay Peninsula being responsible for over 50 per cent. The great advantages are (*a*) the rich areas of stream-tin ready to hand, (*b*) the position on one of the greatest trade-routes, (*c*) the abundance of Chinese labour; and, now that lode-tin is being mined, the industry is acquiring a permanence and a stability which placer mining can never have.

The interest of the **rice** distribution is partly dependent on the relief; for the density of the equatorial wet jungle on the lowlands encourages the growth of upland varieties; and in the oldest-settled areas that are mountainous, e.g. in Java, there is a wonderfully complete system of terracing. In higher latitudes, outside the constant equatorial rains, the jungle is not so dense or so unhealthy; the cultivation is on the flood-plains, e.g. of the Irawadi, the Menam, and the Mekong, the ploughing often being done by buffaloes, especially in the Philippines; and the relatively small population—in scenes of constant war in earlier days—allows a relatively large export of rice. In any case, the value of the grain as food locally must not be judged by its value in Europe—after nearly all the nutritious elements have been 'polished' away.

Reference to the Population map on p. 33 suggests that Java must be not only extraordinarily fertile but also highly cultivated—to carry a population of some 30,000,000 (on an area the size of England) and still have surplus food-stuffs for export. The chief export is of **sugar**, the scientific culture providing a surplus equal to one-fifth of the world's output, so that Java ranks next to India and Cuba for cane-sugar, with great facilities for marketing, e.g. in China and U.S.A. The Philippine islands, with their admirable geographic conditions and their political advantage, should oust Java from the U.S.A. market; but with three times the area of Java, they have not one-third of the population—the ease with which Manila hemp can be collected, minimizes the need for the natives to do any continuous work—and copra and tobacco make large demands on the labour that is available.

The trepang ('cucumber sea-slug') is a very important and valuable food—specially prized in China—associated very closely with the mud flats of coral formations.

The latitude is not particularly favourable to **coffee**, but the altitude, the scientific culture, and the power of the adopted Liberian type of coffee to resist diseases, make Java an important producer of coffee. The Portuguese portion of Timor also produces fine coffee.

The East Indian **tobacco** is of two main kinds—Sumatran and Philippine. In Sumatra the scientific culture, the rich volcanic silt of the cleared jungle, and the 'valley' climate of the eastern plain along the Malacca Strait, produce a leaf so thin and elastic, so tasteless and uniform, that it has unique value as a cigar-wrapper. But similar care—or rather close imitation of the Dutch methods—in similar latitudes makes the Borneo 'Sundakan' leaf almost equally good. The Manila product comes mainly from the province of Luzon, especially from the Cazayan valley, where the annual floods provide an unfailing top-dressing of rich silt.

Historically, the Aru and the Sulu islands have been most famous in the **pearl** fishery, the former producing the greatest aggregate value, while the latter have produced the finest specimens both of pearls and of shell (mother-of-pearl); and the demand for shell in Cochin China (for inlay work) has obviously favoured the Sulu centre. Most of the shell now, however, comes from the Australian banks.

Sago and rice being the staple foods of the natives, and labour—Chinese and other—being very easily procured, the East Indies offer special facilities for modern developments in tropical agriculture. In the old days, of course, the exports were typically articles of great value in small bulk, such as **spices**; and the area is still supreme in the spice market, though some individual spices are of more importance in other areas, e.g. pimento in Jamaica, vanilla in the Seychelles, cloves in Zanzibar, and cinnamon in Ceylon. East Indian spices made the fortunes successively of Vienna, Portugal, and Holland, though cold-storage has now killed the demand for them; and in the days of sailing-vessels Batavia was the natural centre of the archipelago—North-east and South-east Trade, North-west and South-west Monsoon alike converging on it from China and Australasia, from India and Mauritius. Steam has removed the centre now to Singapore, where the two great eastern routes converge on the Malacca Strait—always a difficult piece of water for sailing ships: and the relative importance of pepper amongst the spices has helped to make Singapore the great spice-market, collecting, e. g., cassia from Hong Kong and cloves and nutmegs from the Moluccas via Macassar.

Modern developments, however, have been mainly in the extension of plantation products, formerly limited more or less to sugar and coffee; and much the most important are copra and rubber. The Assam or 'India' **rubber** thrives in Java and Sumatra; and various other kinds, especially 'Para', have been introduced, e.g. in the Malay Peninsula and Borneo, so that Singapore has become a great rubber-port. Malaya is now the most important area in the world for plantation rubber, having raised its output from 900 tons in 1906 to 36,000 in 1913. Nearly all of this is from the *hevea* ('Para'), as the indigenous[1] *ficus* is more or less limited to the more exposed areas, e. g. the Philippines; it is nearly four times the output of Ceylon, and the latter is twice as large as that of Sumatra (3,500) and Java (1,700) put together. Still more important is the outlook for **copra**, which seems likely to be the most important product of all the Dutch islands, except perhaps Java, and of the Philippines; for it requires less labour and less skill than rubber, and has now become a staple food (margarine) in England and on the Continent, without losing its old uses in the making of soap, candles, confectionery, &c. Cf. p. lii.

[1] Gutta-percha, which is also indigenous, is now a plantation product in Java and Sumatra.

Australasia: Physical and Economic.

Pp. 48,* 49. The transition to Australian from East Indian conditions begins, as we have seen, somewhere about Wallace's Line; and certainly the climate of Timor is more typically Australian than East Indian, as suggested by the presence of sheep and ponies. This fact has drawn special attention to the tiny Dutch island of Kisser, as the scene of an accidental 'laboratory experiment' in acclimatization. In 1665 eight Dutch soldiers and their wives were sent here to watch the Portuguese, who were supposed to be casting eyes on the cloves of Amboina and the nutmegs of Banda; and their posterity have survived to the present day, their health and racial fertility having been apparently maintained by the absolute necessity for constant hard work—on a small area of poor soil in a dry climate, quite unsuited to plants providing food spontaneously, e. g. the sago palm.

From the survival of this pure Dutch population, the Australians—attributing all its degeneracy to too close intermarriage—infer that their schemes for the White colonization of Northern Australia are well founded; but the vital question of nerve-injury from ultra-violet sunlight cannot be ignored, and reference to the map on p. 4[D] shows how great is the difference in relative humidity between the two areas, quite apart from the fact that the one is a tiny island (only twenty miles round), while the other is a huge section (at least half-a-million square miles) of a continent.

The comparatively small range of latitude (*c.* 1,000 miles), the large range of longitude (*c.* 2,400 miles), the domination of the Horse Latitudes, and the perihelion summer, combine to account for the high temperature in an area of which more than half is nominally in the Temperate Zone. The consequent inflow of the Monsoon in January is accentuated by the high-pressure outflow from Asia at that season, but the good Monsoon rainfall involves irregular rains off the S.E. Trades. The lack of great and continuous heights is also adverse to rainfall, as is the great heat of the interior in summer; and the horizontal strata and loose surface-soil exhaust very quickly whatever rain does fall. There is often a 40-foot depth of snow on Koskiusco, and snow lies in the higher southward gullies throughout the year; but its peak is 1,300 feet below the snow-line in the Alps, though Switzerland is 700 miles farther from the equator.

The total annual rainfall for all the projecting parts of the coast is at least 30 to 40 inches (80 on Cape York),

* The Economic map on p. 47, of course, logically follows the series on pp. 48 and 49, which summarizes the fundamental conditions.

and all round the normal oval of the continent there is a wide belt with from 20 to 30 inches. Within this, except in the extreme west, is another and still wider belt of 10 to 20 inches; and the great wool-raising area is the large proportion of this belt which has an annual average temperature of under 75° F. The inner slope of the Great Divide from about Hughenden to the west of Victoria is, therefore, the favoured area. Inside this area, however, and up under the influence of the Flinders range (as a precipitating medium) in South Australia, there is an area of 20 to 25 inches of rainfall; and, within this, wheat is an important crop, the summer drought giving a bright, dry, and very heavy grain.

All the normal distributions are represented on the Vegetation map, but they are all adapted to drought, and the isolation of the continent for ages made them very primitive. Various kinds of eucalyptus yield valuable essential oils, and timber with the typical closeness of grain that comes of very slow growth. This accounts for the value of the jarrah wood, and for the danger of over-cropping the nutritious, but slow-growing, salt-bush.

The isolation of the continent delayed colonization, but favoured political unity in it; and the lateness of development is reflected in the presence of abstract lines of latitude and longitude as the typical frontiers. At the same time strategic dangers were minimized so greatly that the capitals of the various States could stand in the best possible commercial position, regardless of any strategic defects; and so from the first they attracted a maximum of trade and therefore of population. Thus, about two-fifths of the N.S.W. population is centred in Sydney, five-twelfths of the Victorian in Melbourne, and nearly half that of South Australia in Adelaide. The smallness of Victoria reflects the relatively high fertility, as the narrowness of the inhabited strip in Queensland and the considerable variety of climate account for the absence of any great concentration on a single centre there. This was accentuated by the relation of the mouths of large rivers, i.e. suitable lines of access inland, to gaps in the Great Barrier Reef.

The insular position of New Zealand, its higher latitudes, and its colder currents, are associated with marked relief features, so that the whole of the west of the South Island has a rainfall of fully 70 inches, and generally over 100; and the dryness of the famous Canterbury Plains is largely due to the föhn character of the westerly winds. Even here, however, some of the indigenous vegetation is curiously slow-growing, e.g. the kauri, which for that reason is—like the jarrah and the karri of West Australia—in great demand. The fossil gum, better shown on the N. Z. section of p. 50, is used in making varnish.

Australasia: Economic.

P. 47. The curious distribution of **sugar** is entirely climatic. It is actually grown as far south as Sugar Loaf Point, but is not important below Grafton—in a latitude corresponding to that of New Orleans—where the temperature range is from *c.* 58° F. in July to *c.* 80° F. in December (the hottest month). The whole area south of Gympie, like that north of Townsville, has a better exposure athwart the S.E. Trades than the area between the two, which runs more or less parallel to them, so that the rainfall is more favourable. Indeed, near Bundaberg—in the lee of Great Sandy Island—irrigation is often essential. The short distance to which the plantations reach inland is due, of course, to the narrowness of the coastal plain and the influence of the Great Divide in deciding the 30-inch isohyet. The distribution of the plantations is rather sporadic, influenced by the system of small holdings; for instance, between the large centres of Grafton and Bundaberg there are several small centres, such as Maryboro' and Maroochy, Nerang and Lismore (cf. Bowen and Ayr between Mackay—the largest centre of all—and Geraldton). The riverine sites of the cleared jungle provide ideal soil, and the substitution of White for Coloured labour has been accompanied by an *increase* in the area under sugar, in the yield and in the profit.

The distribution of **copra** touches Australia at present only from the commercial point of view, because a large proportion of this South Pacific staple is brought to Sydney, especially, of course, from the nearer areas, e.g. the New Hebrides and the Solomons.

The **pearling** industry, like the trepang 'fishery', is associated with the warm shallow waters of the north, especially inside the Great Barrier Reef and on the broad continental shelf between the Exmouth and Cambridge gulfs. The head-quarters in the east, where shell is the special product, is Thursday Island (Port Kennedy); in the west, where the pearls are better and the shell is less good, the centre is Broome. The Shark Bay is interesting as being the scene of an experiment in transplanting the finer oysters of the warmer latitudes, e.g. from Cossack, to a site admirably suited physically, but occupied originally by an inferior type. The cold shallow waters in the south are rich in real fish, especially pilchards.

Australia ranks third in the world's production of **gold**, but the output even of the 'Westralian' fields is declining. At the same time the exhaustion of the surface deposits and the development of deep mining has brought a certain stability into the industry (cf. p. xxxiv); and the discovery of gold gave Australia its first great impetus. The total yield since 1851, not counting £80,000,000 from New Zealand, has been over £500,000,000.

The **dairy** industry in Victoria was closely associated with the gold-mining, for it was practically founded on the admirable railway system needed by, and financed by, the gold mines; and its great success in butter-making has been largely due to co-operation. The spread of the industry up the east coast has been mainly due to heavier rainfall and cheaper land. Thus, in N.S.W. it has spread from the 30-inch rainfall of the south coastlands to the 40-inch rainfall of the north coastlands, the marked gap round Sydney—the worst place for a gap—being due to the infertility of the sandstones covering the coal measures. The development in N.Z. has been due essentially to the oceanic climate and the temperate latitude, in which English grasses thrive wonderfully and grow practically throughout the whole

year, while the original clearing of the 'bush' by burning gave an admirable top-dressing of potash. The ports, too, whether fine natural harbours such as Dunedin and Christchurch, or artificial ones such as Oamaru and Timaru, are very near the pastures.

The meat and wool industries here, however, are much more important than the dairy industry, though the refrigerator has been equally favourable to the transport of meat and dairy produce over vast distances. Indeed, Australasia supplies 22 per cent. of all our imports of butter, 23 per cent. of our meat, and 62 per cent. of our tallow.

Australia—as still a sparsely peopled, if no longer a new, country—keeps first place as much the largest exporter of **wool** in the world, and the character of her pastures is as favourable to quality as to quantity; and, as the main development of the continent has been on wool (cf. the method of holding land, the character and distribution of the railways, the concentration of population at a few large ports), she is likely to remain supreme in the wool trade. N.S.W., with the best-developed river-system, has more than half the total number of sheep, Queensland coming second; and the map shows clearly how the intrusion of cattle is associated with running water. The winter rains and summer drought of Victoria, like its volcanic soil, are very favourable to fineness and length of staple in the wool. The great danger is the irregularity of the rainfall in the interior, but this is now being avoided by the use of artesian water, more than half Queensland, the Lake Eyre basin, and the extreme north of the Darling plains in N.S.W., forming a great artesian basin of over 500,000 square miles in area.

To the south of the Darling plains, river water supplies still more valuable irrigation, on which great fruit-farms exist, e.g. at Mildura and Renmark; and the facilities are being increased by the construction of several dams, the most important at present being at Albany. There are inter-State agreements, the general spirit of which is that each State has a right to its own water, e.g. N.S.W. to the Murrumbidgee, and Victoria to the Goulburn, while South Australia has first claims on minimum flow in the Murray main stream.

P. 50. Silver is said to be the typical metal of N.S.W., as copper has been of South Australia, and gold of Victoria; but the most famous silver-mines, at Broken Hill, have been worked for tin and lead as well as silver,—they are now worked mainly for zinc,—and they are worked through South Australia.

P. 50[A]. Though there is no necessary connexion between volcanoes and earthquakes, both are distributed over those parts of the earth where there has been geologically recent folding or fracture. These are regions where there is generally great difference of level, e.g. between mountain peak and ocean floor, or where there are visible breaks ('faults') in the crust of the earth; the one is characteristic of younger rocks, and the other of older rocks. There is, therefore, special development along the Young Folded mountains of the Old World—from the Cantabrians to the Himalayas, along the similar uplift of the New World, and along the great 'fault' of the Asio-African rift-valley. In themselves, like the Arctic and Antarctic regions—which may prove to be of enormous importance in maintaining the fish supply, e.g. of the North Sea—volcanoes and earthquakes are at present of little importance in Economic Geography; but reference to p. 50[D] will show how maximum disturbance may be expected where the great longitudinal line of activity crosses the latitudinal, especially when this is accompanied by maximum difference of level and maximum precipitation of torrential rain.

The Pacific Ocean.

Pp. 50[B–C]. The line of Drainage Limit marks the shallowness of the Pacific hinterland, which, however, is partly discounted by the trans-continental railways of North America—leading obviously to trans-oceanic commerce; but there is not really any similar result of trans-continental traffic in South America.

The shallow hinterland is associated with a gigantic area of ocean. From Guayaquil to Singapore the distance is 12,000 miles, and along three-quarters of the route the only sources of traffic are islands too small to give large cargoes, and of a physical character not associated with coal. This route, though practically a Great Circle, is therefore not worth taking.

The ocean, however, is so large that it offers two other Great Circle routes between the same two points. Each runs into very high latitudes, and each has coal at both ends (N.S.W. and Chile, Japan and British Columbia); but the southern one risks Antarctic ice, and has practically no trade. The northern one, on the contrary, is very important, and will be more so when the Panama Canal is open. It has large lands and dense populations at both ends; the shortest routes from all parts of Asia to all parts of North America hug the coasts of both, skirting a dozen important harbours,—so that it is practically no loss of time to call at Yokohama and Manila or at Vancouver and San Francisco; and Behring Strait is so shallow and so narrow that vessels can hold the extreme north course of the exact Great Circle at all times of the year without fear of ice. Shanghai is 1,400 miles nearer to Panama by this northern route, calling at these ports, than by Guam and Manila.

Of course, the centre of the ocean must be crossed between Canada or California and Australia or New Zealand; but coal can be carried for the whole voyage, as the distance does not exceed 6,000 miles. And the routes are important because of the rareness of bad weather on the ocean and the speed of the trans-continental trains. Obviously the most important focus is Honolulu; and the Fijis are rather more important than Samoa, and Samoa than Tahiti. The mineral wealth of New Caledonia (especially cobalt and nickel) has thus easy access via Noumea to a busy route.

The United States thought it worth while to seize the island of Tutuila, so as to have in Pago-Pago a better harbour than Apia. (See inset.) Indeed, Pago-Pago is probably the best natural harbour in the whole Pacific.

PART III—PRODUCTS

Pp. 51–60. These diagrams of plant distribution should be studied mainly as illustrations of climatic control. The importance of the geological factor in edaphic conditions was recognized long before soil-character was recognized as a function of climate; and, in any case, the usual deficiencies of soils can be made good by scientific tillage and treatment—at least, so as to suit more or less all ordinary crops, especially as very rich soils are rare. The reason for this is the connexion of abundant rainfall with leaching; and so soils may be roughly divided into dry, moist, and definitely pluvial, associated respectively with (*a*) low rainfall and high temperature, such as characterize hot deserts, (*b*) abundant rainfall and moderate temperature, such as are typical of a marine climate in temperate latitudes, e. g. Europe, and (*c*) heavy rainfall and high temperature, such as are found in equatorial latitudes. The desert soil, of course, has lost none of its soluble salts, but its fertility is useless in the absence of moisture; the abundant moisture of the temperate marine area acts on a soil usually deficient in fertile elements; and where heavy rainfall is associated with high temperatures, chemical decomposition is so rapid as to give rise to mixtures of oxide of iron and clay, thus producing, e. g. laterite, a red earth as typical of hot damp regions as peat is of cool damp regions.

Wheat.

P. 51. The present distribution of *wheat* is strictly neither a physical nor a climatic response, but economic; and new facilities for transport and new supplies of labour are changing the distribution every year, especially in Canada and Siberia. If 'economic' may include botanic considerations, there will be still further extension from the application of Mendelian principles, such as have produced the Burgoyne Fife and Little Joss varieties—varieties so fixed that seed corn produced by them seems to remain 'permanently' true to type. The extension will, however, be ultimately limited by the climatic control; and it will certainly be poleward rather than equatorward. In the latter direction possible 'wheat' land can be used more profitably for other crops, e.g. maize; and the high percentage of blue and violet light in low latitudes is adverse to the plant. On the contrary, the high percentage of red and yellow light in high latitudes is favourable; and the spread of cultivation, by its influence on the nocturnal radiation of heat, will eliminate the fear of 'killing' frost during the wheat season.

Wheat is a grass first and then a grain, requiring specifically first moisture and then heat; and the development of the grain depends on the previous development of the grass, for which a relatively cool and moist season is as essential as a dry and sunny season is for the grain. The ideal climate is, therefore, of the Mediterranean type, and wheat is a native of the Mediterranean basin; but the seasonal régime of the Mediterranean can be represented by the semi-seasonal régime of the great temperate grasslands, with their early-summer rain and their late-summer drought. Obviously, however, such grasslands are only suited, as a rule, to Spring wheat; for the alternate freezing and thawing is fatal to Winter wheat, i. e. wheat sown in the autumn.

This Spring wheat is generally so hard and brittle that it was of little or no value before the invention of the 'gradual reduction' process of milling; and the use of Durum varieties of wheat in arid areas is still more recent. The drier areas of U.S.A. have profited as much by the latter as the colder areas of Canada have by the former. In both cases the land is 'new' land, and there is the further advantage that wheat is probably the best of all pioneer crops—easily grown, easily kept for a considerable length of time, and easily transported, while it has a high value and an assured market along with a wider range than its great rival, maize.

The two most important problems, therefore, would seem to be (*a*) the lower limit of temperature and (*b*) the lower limit of rainfall; for wheat, like every other plant, demands at every stage of development a certain appropriate temperature and a certain amount of moisture. The temperature may be classified as minimum, optimum, and maximum;[1] and it may be measured by degrees and by duration. The lower limit for the germinization of wheat may be taken as between 40° and 41° F.; and, according to latitude (with its varying duration and intensity of light), it requires a certain number of degrees above this limit for a certain number of days. The quotient of these two factors is known as the accumulated temperatures in day-degrees; and, with due allowance for the light, the number varies from *c.* 1,300° to *c.* 3,000° F., higher accumulated temperatures being required in areas of higher mean temperature. At St. Paul, in latitude *c.* 45° N., with an average temperature of 63° F., and an average light-duration of *c.* 15 hours, the accumulated temperatures are *c.* 2,750° F. At Brandon, in latitude *c.* 50° N., with an average temperature of *c.* 61° and an average light-duration of nearly 16 hours, they are only *c.* 2,360. Obviously, even at 60° N., with an average light-duration of $17\frac{1}{2}$ hours, the summer is long enough to ripen wheat in any normal season at any normal altitude; and therefore the poleward extension of wheat-growing offers immense possibilities.

[1] The whole subject is admirably discussed in Dr. Unstead's paper contributed to the Research Department of the Royal Geographical Society (March, 1912).

The possibilities of extending it into arid areas are also very good. As the accumulated temperatures correspond with the average temperatures, so the minimum rainfall varies with the relative humidity; but, while temperatures must be those of the years in which the wheat is grown, the rainfall is not similarly limited. Of course, if the winter is not too severe in such an area, the wheat can be autumn sown, and so has a much longer time in which to take up moisture; but if the winter is too severe for autumn sowing, dry farming—with its mulch of loose dry soil—not only conserves the moisture of months previous to the sowing, e. g. in Russian Turkestan, but also forces the roots to develop downwards to the lower and damper layers.

This is so important that it is actually the secret of successful wheat-growing even in England. To get a good root-system the plant must be able to breathe, so that a very wet autumn is fatal; but even when the plant is not choked, it does not flourish when it can get its water-supply very easily, i. e. at no great depth. Of course, there are other evil results of a wet autumn, e. g. the delaying of seed-time and the leaching of nitrates; and the latter is specially important because wheat is generally not manured, but left to glean the fertility accumulated during the previous rotation. But the injury to the root-system is the greatest evil, because it cannot be made good, as the absence of nitrates can, by a top-dressing in spring. These factors underlie Dr. W. N. Shaw's formula for forecasting the East Anglian yield—which averages 39·5 bushels *less* $1\frac{1}{4}$ bushels for every inch of rain recorded in and between the thirty-sixth and the forty-eighth weeks of the year, i. e. practically the three months of September, October, and November. If this is checked by the rainfall of the following three months, during which the main development of the plant is still underground, it gives a practically exact forecast.

This throws light on the astonishingly small rainfall on which wheat can thrive—*c.* 10 inches in 'Mediterranean' climates or on northerly grasslands, e. g. in Canada, increasing slightly on more southerly grasslands, e. g. in U.S.A. Obviously, therefore, with proper selection of seed and proper methods of cultivation, it might be grown over the whole of the semi-arid area of Canada (in Alberta and Saskatchewan) and westward right up to the Rocky Mountains in U.S.A. Part of this, no doubt, is unsuitable soil, and part will be more profitable under other crops; but the possible area must be immense, and already the most important wheat-belt in America, from Texas to Alberta, runs parallel with the twenty-inch isohyet.

The early summer rains, on which Spring wheat depends, are due to the formation of 'low-pressure' areas as the sun-heat increases; and, therefore, the mass of the rain (three-quarters of the total fall on the prairies) falls precisely when the young wheat needs it most. And, as the decrease of temperature in autumn naturally stops the inflow of the warm wet winds, harvest time is normally dry. The French crop—of Winter wheat—is important because its quantity depends on the semi-marine character of the winter in France, while its quality depends on the largely continental character of the summer. The Indian crop is Winter wheat in a different sense—it *ripens* in winter, the cool and dry season; and its distribution depends entirely on the length of the cool season, the Indian wheats being very speedy ripeners. The importance of the Indian crop has lain in the past largely in the fact that practically *all* of it was intended for export, the local population consuming rice in the typically damp areas and millet in the typically dry areas; but it is now largely used in India. Cheapness of land and of transport are important points in connexion with the American crop, while cheapness of labour is important in connexion with the Russian and Indian crops.

The world's output of wheat is quite keeping pace with the demand, but this is largely due to the increased supply provided by the British Empire; and it is worth noticing that Canada is the only large exporter with a large yield per acre (21·5 bushels), the U.S.A., Russia, India, and Argentina having yields varying from *c.* 16 down to *c.* $10\frac{1}{2}$. While the wheat area in U.S.A., however, has remained practically stationary, and her exports have rapidly declined, the Russian output has greatly improved in both respects, and the Argentine has made up the deficiency of the States. The wheat area of the Empire has risen from $11\frac{1}{4}$ million acres in 1901 to 20 millions in 1911, i. e. by nearly 80 per cent., while the population only increased from 51,500,000 to 58,000,000, i. e. by 13 per cent.; and while in 1901 only 20,000,000 cwt. of Empire wheat were imported into the United Kingdom, i. e. not quite 20 per cent. of the total, in 1912 *c.* 59,000,000 cwt. were imported, i. e. nearly 55 per cent. Canada, of course, is the most important area, with an assured output now of over 200,000,000 bushels, 25 per cent. of which she can spare for the Home Country. Australia, with a very much smaller output, can spare an even larger percentage (nearly 30); but her output varies to an unfortunate extent, e. g. from 12,000,000 bushels in 1903 to 95,000,000 in 1911!

Maize.

P. 52. *Maize* is also closely connected with summer-rain areas in warm-temperate latitudes, e.g. along the Dniester, Danube, Plate, and Mississippi; but it has a much smaller climatic range than wheat, and—as its special use is as food for cattle and 'hogs'—its export depends largely on very cheap transport. Its ability to grow on very rough land and to 'stand' for weeks when ripe, its large yield, and its quick return, give it a very great importance; but it does not thrive in continuous high temperature nor in continuous heavy rain. At present nearly five-sevenths of the world's output, which approaches *four billion* bushels, is produced by the U.S.A., where the crop has a value (fully £250,000,000) greater than that of wheat and cotton combined, and where the cash return per acre (over considerably more than 100,000,000 acres) is nearly twice that of wheat.

This is, of course, obtained by White labour (earning fully £5 a month as well as board and lodging); and, as only 1·5 per cent. of the U.S.A. crop is now exported, South Africa, with its Native labour already identified with maize-growing, should receive special attention. Argentina, the chief exporter, exporting three times as much as Rumania, and

four times as much as Russia, produces only 5 per cent. of the world's crop; so that there is an obvious opening for a country with such advantages as those of South Africa.

Even the seven 'Corn Surplus' States of the U.S.A. Maize Belt have a less favourable climate[1] than the Maize Belt of South Africa, which may be defined roughly as the land between 1,000 and 6,000 feet lying east of 26 E. and between 25° and 30° S., the best areas being in the N.E. of the Orange Free State and the S.S.E. of the Transvaal. As a native of tropical plateaus, maize is not very sensitive directly to either temperature or altitude *per se*; and South Africa supplies the optimum temperature of a midsummer mean of *c.* 77° F. (sea-level), with a mean for the four summer months of 65°–70° F. So with rainfall, which—unlike the temperature and the altitude—has a very direct relation to the yield. The three summer months have the necessary minimum of twelve inches, and about five-twelfths falls when the ears are growing most rapidly (January to July); and the fall is intermittent—maize, as an 'open plateau' product, being peculiarly sensitive to sunshine. The dry winter, too, which makes *ripe* maize impervious to the frosts, gives South Africa a great advantage over Argentina, where the alternate visits of frost and wet force farmers to cut much of their crop immature, the initial 'drying month' of April being constantly wet. Even over the U.S.A. crop the South African has an advantage of 4 per cent. less moisture,[2] lessening danger of damage in transport and aiding manufacture. There is also in South Africa a local market, at present not known in Argentina; and the grain can be put on the European markets, i. e. practically, Liverpool and London, in July—that is to say, before the United States crop is in sight, and after the bulk of the Plate crop has been moved.

The other large producers, India, Mexico, Hungary, and Rumania, are not serious rivals. India consumes, mainly in the hills, all she does, or is likely to, produce; the grain is a staple food both in Mexico, where the crop might be doubled by irrigation and trebled by better methods, and in Rumania, where very heavy yield leaves a large surplus for export (to England) only so long as the local demand does not increase greatly; and in Hungary the crop has reached its limits, and is stationary.

At the same time it must be remembered that the inferior position of maize in Europe—in spite of obvious geographic advantages for its production—is largely due to the fact that it is grown, as it will be grown for years in South Africa, for direct export *as grain*; and, although there is a very steady demand for the grain, it is nothing compared with the demand for cattle and pig products—the form in which the mass of the U.S.A. crop leaves the farms on which it has been grown. This also accounts—along with the good soil, good seed, and good cultivation—for its being grown in the U.S.A. on small or smallish farms (80 to 300 acres).

Barley.

Barley has a wider climatic range (both in latitude and in altitude) than any other cereal, and is probably the most ancient of cultivated grasses. It does well wherever wheat flourishes, e. g. in Russia—with the advantages of a much greater yield per acre and the ability to thrive in a poorer soil; but the best qualities come from areas of summer drought, i. e. 'Mediterranean' climates, especially from Asia Minor and California, and in these areas it is often made into *hay* for horses.

Oats.

Oats prefer a cool and moist climate, rice prefers a hot and moist one; oats, therefore, are specially suited for areas of light rain evenly distributed throughout the year, e. g. Ireland and Scotland, while rice is most suitable for Monsoon areas, especially low-lying areas that can be easily flooded, e. g. the deltas and flood-plains of great rivers. But oats—in spite of their large bulk *in re* value—enter much the more largely into commerce, because rice is essentially consumed where it is grown, its presence accounting for the dense population of the typical Monsoon areas (cf. p. 34). The importance of oats in the 'soft' wheat region of eastern Canada is due to the climate being too harsh for maize, while its importance in the U.S.A. is due to its climatic correlation with maize. Wherever the winter is unfavourable to Winter wheat, and yet the summer is not quite favourable to Spring wheat, oats may be, and are, grown; and, as they are sown before the maize and ready for reaping by the time the maize is well started, they dovetail in excellently with the more important crop.

Commercially, maize bears somewhat the same relation to barley as rice does to oats, but its local consumption gives a clue to the number of animals, especially cattle and pigs, not to the human population, and it is relatively a 'dry' grain, being often damaged by the humidity in transit even from the U.S.A. Corn Belt to Europe.

Rice.

Rice, on the contrary, can scarcely have too much moisture—except in the form of stagnant water; and the dryness of its kernels and the damp-proof texture of its husk make it easy to store even in the highest humidity. It does not make bread because of its lack of gluten, but its high content of starch enables it more or less to take the place of both potatoes and bread, provided it is supplemented by a liberal supply of pulse (peas and beans). Rice, of course, has a food value greatly inferior to that of wheat; but, as wheat is the chief bread-stuff of dense populations in temperate latitudes, so rice is of dense populations in tropical latitudes. The wheat-eaters, however, import their staple from distant sparsely-peopled lands, while the rice-eaters grow theirs on the spot; so wheat enters into commerce much more than even oats.

Rice is specially identified with tropical and sub-tropical Monsoon lands, China and India being the great producers, and India being the great exporter (*c.* one-third of the total world's export), followed by French Indo-China and Siam. The relatively sparse population on the Irrawaddy flood-plain contrasted with those of the Ganges, Menam, and Mekong, accounts for the importance of the crop in Burma.

[1] The yield depending closely on the mid-July—mid-August rainfall.

[2] The U.S.A. maize takes, on the average, two months to dry.

P. 53. *Potatoes* and *Sago* offer a good contrast. The potato illustrates well the importance of using the term 'Natural Product' with a special meaning in Economic Geography. As the amount of available unoccupied land decreases, the need increases for using occupied land in the best possible way. This is probably done most satisfactorily by using it, e. g. for such plants as are 'Natural Products'—in the sense of indigenous to the particular place; for instance, the best rubber will probably be obtained from plants artificially cultivated in areas where rubber grows, or has grown, wild. The term 'Natural Product', therefore, may be taken to describe a product raised perhaps artificially, but under essentially natural and appropriate conditions, as distinguished from an 'Unnatural Product', i. e. one raised under unnatural and inappropriate conditions.

Potatoes.

The potato is a native of the high and dry Andean plateau; but it tolerates almost any soil except a heavy clay, and has extraordinary powers of acclimatization provided the sun-heat is not materially greater than in its native home, so that it can be grown at sea-level in high latitudes, in either moist or dry climates. It is, however, specifically the great starch-plant of cool climates, as rice is of hot climates; and it prefers a light sandy soil. This explains its importance in 'hardy-grain' lands, e. g. north-central Europe and the St. Lawrence basin (both Canada and U.S.A.) and its insignificance in 'soft-grain' lands, e. g. the maize lands of south-eastern Europe and the Mississippi basin. The heavy yield and the large amount of labour demanded by the crop make it appropriate to small holdings and dense populations (cf. Ireland and Belgium); and the complete disturbance of the soil in 'harvesting' leaves it in such an admirable condition that the crop is of special use in lands devoted to winter grain, e. g. on the North European plain. Like rice, however—partly because of its great weight and bulk *in re* value—it is a local rather than a commercial crop, the exceptions being (*a*) where the crop is raised as an 'early' crop for consumption in lands of bleaker climate, as e. g. in Algeria, the Channel Islands, and the Bermudas, and (*b*) where a practically non-edible variety is raised for alcohol, as e. g. in Germany, Russia, and Austria. These are the three great producers, producing respectively *c.* 30, 23, and 13 per cent. of the world's output.

Sago.

The sago palm is a native of the East Indies, and the whole supply for the world practically comes from the eastern half of the archipelago—in sacks made out of the leaves of the palm. As a plantation renews itself, and even extends itself, without human labour, and as it ripens at all seasons of the year, and gives an enormous amount of food-pith, it puts a premium on laziness. Some labour is needed, however, before the pith is fit for food; and the tree does not mature till it is fifteen years old.

Dates and Coconuts.

Dates and *coconuts* are lovers respectively of dry heat and damp heat—the one being essentially at home in tropical deserts, the other on tropical shores; the one is, therefore, a typically continental plant, while the other is typically oceanic. Both are exceedingly useful where they grow, the coconut providing juice for 'milk', nut-shells for cups and bowls, fibre for 'coir' rope and mats, leaves for thatching, wood for oars, boats, houses, &c.; and the products of the date-palm have similar uses. The coir and copra (dried kernels) enter much more largely into commerce, however, than do the products of the date-palm; and, of course, islands are infinitely more accessible than deserts, though the extension of the Algerian railway into the Sahara has made Biskra a rival of any of the Mesopotamian markets. The most important development of coconut products, however, is as a substitute for butter, the output of margarine in Europe being calculated at some 20,000,000 lbs. per week. The finest fibre comes from palms grown close to the sea, i. e. where cheap transport is most accessible; and, if the humidity is also low enough for sun-drying of the copra, this is a further advantage,—which accounts for the Malabar coast getting often the highest price for copra and oil ('Cochin'), the latter being worth now £50 a ton.

P. 54. Not only is the essential property to which *tea*, *coffee*, and *cacao* owe their stimulating value practically the same in each case, but in other respects also they have much in common. All three require a rich, light, friable soil, with abundance of 'humus' in or on top of it; they all need frequent heavy rains, but a well-drained subsoil; they all derive great benefit from shade. A favourable site would, therefore, be a clearing in a forest on the side of a hill exposed to Trade-wind or Monsoon rains. Again, they all demand a great deal of labour, which must be both cheap and not clumsy; for instance, in picking cacao it is most important to avoid injuring the buds and blossoms which are to give the next harvest. They are alike again in not giving an immediate return on cultivation, the planter having to wait from three years (for tea) to twelve (for some kinds of cacao—or cocoa) before seeing any real profit. These conditions combine to limit the distribution of the products very materially, e. g. climate often being suitable where there is no cheap good labour.

Tea.

On the contrary, there are interesting differences between the plants, especially from the climatic point of view. For instance, the *tea* is a shrub, and its value is in the leaf; and, as the leaves are best when they are young, the crop is usually picked in 'Spring'. The plant is also essentially a sub-tropical plant—one of the hardiest of all such plants; and, therefore, it has a wide climatic range, being able even to stand severe frost. This accounts for its flourishing in the temperate area of S.E. Asia. There are two kinds of tea plants, highland and lowland, the former being the finer but the latter the more productive; and there are two kinds of tea, black and green, the difference being entirely due to the process of manufacture. Thus, green tea may be made from the so-called 'Black Tea-plant' (Thea Bohea) of the Canton district, and black tea may be made from the so-called 'Green Tea-plant' (Thea *viridis*) of the Chekiang district.

The best varieties of tea are natives of north-eastern India, especially of Assam; tea is, in many ways, the most typical export of Monsoon Asia[1]; and the British Empire essentially controls the tea trade of the world. In 1912 *c.* 42 per cent. of the total output was produced by India and 28 per cent. by Ceylon, while China raised only 6 per cent., Java 9 per cent., and Japan 6 per cent. (9½ per cent. if Formosa is included); and, of the total 730,000,000 lb., the British Isles consumed 42 per cent., Russia 21 per cent., and the United States 8 per cent.,—Canada coming next with *c.* 5 per cent., and then Australia with 4 per cent. But, while the *per capita* consumption is 6 lb. for the Empire, it is only ¾ lb. for Russia and for the States, and the Russian demand varies greatly—with the Russian grain harvest.

The plant does best in a warm sub-tropical climate rendered more or less continuously damp by an evenly distributed rainfall of at least 60 inches—the best Indian districts having over 90, and so distributed that there is always a sufficiency during the four dry months (February–May); and the optimum temperature is with a daily range between *c.* 75° and 85° F. Leafage seems to depend mainly on the presence in the soil of organic matter and nitrogen, and quality on that of phosphoric acid and potash; and, as rotation is not possible with a 'permanent' crop such as tea, these elements must be supplied artificially. Cp. p. xxvii.

Assam and Bengal contain nearly nine-tenths of the total area under tea in India; and tea is still the chief crop in Ceylon, almost nothing else being cultivated at altitudes above 2,500 feet. In both countries the tea area coincides more or less with the area of maximum rainfall, but in Ceylon there is continuous picking, and the tea is the only crop—the district between Kandy and Nuwara Eliva being one of the largest 'single-crop' areas in the world. Java, of course, has also continuous picking, and its abundance of humus and nitrogen gives a large leafage, but the deficiency of available potash and phosphoric acid makes the quality inferior. The chief area is that of Preanger, and the labour supply is good and abundant; but it is localized, and so the plantations are neither continuous nor very large. The best tea is made in the dry season.

In the Temperate Monsoon area the tea is, unlike that of the Tropical Monsoon area, grown on small 'peasant' holdings in a season so short that there can be only three or four pickings; and labour is so cheap that machinery usually does not pay. The main tea area in China is in the lower part of the Yangtse basin, e.g. Hupeh, Hunan, Ngan-whi, and Kiangsi, i.e. all *inside* the 'Bohea' line, the minor area lying to windward of it in Kwantung, Fokien, and Chekiang. In Japan the chief areas are in the centre and south, Shizuoka being the most important, though Uji grows the best tea—except for the Oolong tea raised in the north and north-west of Formosa, i.e. in the latitude of the famous Surma valley in India.

[1] Outside Monsoon Asia, Natal, which exports *c.* 2,000,000 lb. a year, is the only country where tea is grown on any scale, the area indicated on the map in California being of no practical importance.

Coffee.

The *coffee* is also a shrub, but considerably larger than the tea—reaching from 15 to 20 feet; it is also of two kinds, highland and lowland, the 'Arabian' highland kind being much the finer, especially in aroma, but the 'Liberian' lowland kind being the more prolific. The plant has not as wide a climatic range as the tea, being very sensitive to cold and to hot dry winds. On the other hand, its value is in the fruit, not the leaf; and the most perfectly ripened fruit comes from dry and hot areas, where the berries can be allowed to mature until they drop off. This accounts for the excellence of Bolivian and real Mocha coffee, as the constant warmth and moisture account for the excellence of the 'Blue Mountains' crop in Jamaica. Like the tea, the plant must be protected from heavy winds; and it also requires shade from the sun—an 'optimum' mean annual temperature being 68°–70° F.; and this 'shade' is provided for the Mocha plants by the mid-day mists off the steaming waters that wash the Yemen coast. Access to the sea is always important, however, as coffee is grown essentially for export, not for local use.

The very fine quality of the real Mocha coffee—though Yemen does not grow a tithe of what is sold as Mocha—is due largely to the very careful preparation; but the plant is also of a naturally fine type, and that is the main reason for its liability to fungus disease, especially in areas of high humidity, such as Ceylon. The real Liberian coffee, which again is quite limited in amount—most 'Liberian' coffee coming from Java—is more or less free from fungus trouble, but is inferior in quality.

South America controls the whole trade, the various Cordilleran States together coming next to Brazil—but with only 8–9 per cent. of the world's output,[1] though some of it is of a very fine quality. The total product of Central America is practically equal to that of the Cordilleras, Guatemala having the largest amount, mainly from German plantations, while Costa Rica has the finest quality (cf. p. xliv); and in the past coffee has made the western or Pacific valleys of Central America almost as specifically a 'single-crop' area as tea now makes central Ceylon. On the Atlantic side the Mexican and West Indian coffees are generally considered together, the largest amount coming from Haiti and San Domingo, but the best quality from Jamaica, though the outer slopes of the Mexican plateau produce large quantities of very good quality. The East Indies are the only other important area, though small quantities of very fine coffee are raised in Uganda and Nyasaland—specifically by White planters, height compensating for latitude.

Cacao.

The *cacao*, or cocoa, tree is more tropical even than the coffee, having the typical 'wet-jungle' habit of bearing its fruit on its *stem*, i.e. the part of the tree most accessible—in dense jungle—to the insects which fertilize the flowers. It is also more sensitive to exposure than the coffee, being peculiarly sensitive to winds of all kinds, especially winds off salt water; it also, unlike tea and coffee, prefers a

[1] Of this 8–9, *c.* 99 per cent. comes from Colombia and Venezuela.

volcanic soil. The cacao, therefore, grows normally as much nearer to the Equator than the coffee as the coffee does normally than the tea; and there is no 'highland' variety. The deep, moist, volcanic valleys of Central America and the Northern Andes are, therefore, almost as favourable positions as the Selva lowlands of which it is a native; but low-lying windy islands such as Barbados are not suitable. The conditions of production are very adverse to White men, and this has led to some gross irregularities in the matter of labour, especially in the Gulf of Guinea, where São Thomé and Principe have a production greater even than that of Ecuador and Brazil. There has been an extraordinarily rapid development in the production of cacao on neighbouring parts of the mainland, especially in the Gold Coast, which—with 50,000 tons—was the chief producing country in the world in 1913.

Cane-Sugar.

Sugar-cane is like cacao in its preference for lowlands and for volcanic soil, but it has a wider climatic range than even coffee; it is never found along with tea, as it must have easy access to lime, which is absent from typical 'tea' soils. The character of the soil is, indeed, of prime importance, the best being loams rich in humus and derived from volcanic, coralline, or crystalline rocks. The most suitable climate is one where hot wet weather alternates with hot dry weather, especially where there is salt in the air or in the soil or in both; but, as the cane is usually at least eighteen months in maturing, the average annual temperature is important, 75° F. being desirable—with a 'summer' of nine months' duration. While harvest-time must be relatively dry, the growing season should receive *c.* 60 inches of rain. The plant is, therefore, obviously much 'at home' in volcanic islands inside the tropics, and on the windward shores of such islands it is one of the very few profitable crops. In India, where the annual crop exceeds 2,000,000 tons, it is grown entirely for local use, the great exporting areas being essentially islands, e. g. Cuba and Java, Hawaii and Mauritius.

South America is perhaps the most interesting continent, because it illustrates almost every aspect of sugar-cane culture. On the volcanic alluvium of British Guiana, behind the dykes originally made by the Dutch and largely extended in modern times, magnificent sugar is raised 'intensively' by East Indian coolies in a vile climate but with easy transport on irrigation canals. Brazil raises poor sugar by primitive methods on the low plains south of C. San Roque, i. e. in the teeth of the S.E. Trades, especially round Pernambuco and Maceio. Argentina and Peru are purely irrigation areas, the one using the semi-desert in the province of Tucuman and the other using the actual desert strip south of the Guayaquil Gulf.

While India and Cuba[1] are much the largest producers, and Cuba and Java are much the largest exporters, much the largest yield per acre comes from Hawaii, which—with Puerto Rico—raises seven-eighths of 'United States' sugar. This large yield (averaging four tons to the acre, i. e. double the return in Cuba and Java) is due to (*a*) an almost virgin soil composed of débris from the great volcanoes, and (*b*) an almost unique system of irrigation. The reason for Cuba outstripping Java is the relatively small population compared with that of the Dutch island—i. e. it is the victory of virgin soil and unlimited area over very scientific agriculture and limited area; and when the population of the Philippines has doubled, it may be able to use the advantages which it shares with Cuba.

[1] Unfortunately, the diagram of annual production is confused. The two sections labelled 'United States' and 'Cuba' should be one (Cuban), and therefore should precede the 'Java' section.

Beet-Sugar.

Sugar-beet resembles sugar-cane in its apparent liking for lime and salt, but it could scarcely compete with the cane except for the extraordinary amount of 'artificial' encouragement which it has received from the Governments of Central Europe. It certainly can be grown close to dense manufacturing populations in temperate latitudes, where capital, markets, machinery, and manure are easily accessible; but it is only an annual, it requires careful intensive cultivation—in areas where labour is relatively dear, and it is not nearly so rich as the cane in sugar, though scientific selection of seed has greatly increased the sugar-content in recent years, in some cases even trebling it. The demands of the plant are not at all like those of the cane. For instance, the average annual temperature is obviously of no moment; but other climatic conditions are very important, especially with regard to rainfall. This must be abundant during the winter—fairly abundant in spring and early summer, but in the form of showers interspersed with sunshine, i. e. typical 'April showers'—slight in late summer, and entirely absent in autumn (especially October). Further, this autumn must be cool, and the summer must be thoroughly warm without being actually hot. The soil must be fertile, but the return per acre is very large, so that it suits small holdings, e. g. in Belgium; and for the same reason it suits irrigation areas where, too, its somewhat exacting requirements in the matter of water-supply can be most easily met.

Germany is, of course, much the largest producer, the (salt-raising) province of Saxony being the special centre; but both Austria-Hungary and Russia produce about one-fifth of the world's total crop. There is also an important sugar-beet area running from N.E. France through Belgium into Holland. Spain is the only country in Europe, as U.S.A. is in America, that produces considerable quantities of both beet and cane sugar. The total output of beet-sugar has increased since the middle of last century from 600,000 tons to fully 8,000,000; and the total output of cane-sugar has risen in the same time from 1,500,000 to nearly 9,000,000. In both cases the production per unit of area is constantly rising, especially that of cane in Java, where the total output has been doubled since 1899 and quadrupled since 1889.

Bananas, Apples, Oranges.

P. 55. The *banana* is one of the most nutritious, as well as probably the most prolific, of all food plants. The banana and the plantain are respectively what may be called

the 'fruit' and the 'vegetable' varieties of the same plant; both are of various sizes, are perennials, and yield a return within a year. Whether as a fruit or as a vegetable, the plant has a double value, as a local staple of food and as a cash crop; but the plantain, which has a superior value corresponding to the better soil that it needs, is not exported to England at all. Our supplies, indeed, are practically limited to two kinds of real banana, the dwarf Canary or Chinese kind, and the larger Jamaica or Fiji kind. The former, as its Chinese origin implies, is the hardier plant, but it bears the softer fruit—sensitive to both cold and pressure, so that it needs to be properly packed for transport. This favours the import of the harder fruit from the less hardy plant, especially from the more distant sources of supply, e. g. the West Indies and Central America. Even for local use the fruit has a better flavour if cut before it is completely ripe, so that there is no objection to cutting it unripe for transport; but it is very perishable, and demands quick transport. It is obviously an advantage, therefore, for the plantations to be near the sea; and, as the plant combines jungle origin with sensitiveness to good drainage, hilly forested islands have special advantages, especially if well outside the 'hurricane latitudes' and if planted with the dwarf Chinese variety. This accounts for the importance to north-west Europe of the Canaries and the adjacent islands, and for the importance of fast transport from Jamaica, Costa Rica, and Colombia. The enormous demand for the fruit is encouraging its cultivation very widely, especially in areas of 'fat' soil (which improves the flavour) on or near great trade-routes, e. g. in Egypt, where banana culture is already exceedingly profitable.

While the banana is typically the product of a marine climate—being often used as a shade tree for cacao plantations—the *apple* is typically a 'continental' product, flourishing best where the spring is so short that the plant cannot make both wood and fruit successfully, and where the sudden and short autumn stops the rising of sap directly the crop has been gathered. These continental climates have also, as a rule, dry weather in the late summer and early autumn—when the 'low pressure' is failing (cf. p. l); and this is very favourable to the quality and the keeping of the apple. In these climates, however, the tree—although still the longest-lived of all important fruits in purely temperate latitudes—seems to be less so than in semi-continental climates; and its cultivation in the latter is encouraged by the ease of transport by water implied in their being semi-continental, for the fruit is rather easily bruised and has large bulk and weight in proportion to its value. But the finest flavour is found in the purely continental apples, e. g. in the Yablunka ('Apple-tree') valleys of the Carpathians, or the similar valleys of the Yablonoi ('Apple-tree') mountains, while the most beautiful are the irrigation products, e. g. of the Pacific States of North America.

This natural distribution in highland valleys implies a very hardy plant—equally indifferent to climatic extremes and to rough and steep situations; and both considerations are very important. For instance, in North America there are four great apple-growing areas. The chief is the heavily glaciated land round the Erie and Ontario lakes, especially in the States of New York, Pennsylvania, and Ohio, and on the Niagara peninsula of Ontario, though the neighbouring areas are also important, e. g. Michigan and West Virginia; and New York State, the largest producer, illustrates some very interesting points. Thus, originally settled by farmers, it was very seriously affected by the Erie Canal and the development of railways along the Mohawk valley, by which cheap grain and animal products were imported from the virgin 'West'. The dislocation caused by this was righted largely by the improved transport which had caused it (though ultimately by the great concentration of population round the mouth of the Hudson), the old farming being replaced by fruit-growing and dairy-farming; and the climatic protection of the lakes attracted the fruit-growing to the western end of the State as the nearness to New York city attracted the dairy-farming to the eastern end.

The other three centres are in Nova Scotia, on the Pacific hinterland, and on the Ozark plateau. Between pine-clad heights and the Bay of Fundy, especially round the Minas and Annapolis basins, soil, climate, and access to water transport enable an old-established industry to thrive and expand. The tough old rock of the Ozark uplift, though adverse to grain-growing, provides rough steep slopes on which apple-trees flourish, while the actual elevation and the direction of the northern crest give great protection against frost. On the Pacific hinterland from the north of California to the south of British Columbia is the third centre, the area in and on the edge of the 'Mediterranean' climate and in the lee of the Coast Range being an irrigation area; and it is the high percentage of bright sunshine that gives such a beautiful appearance to the fruit, especially in Oregon, that—in spite of very costly transport and somewhat inferior flavour—it finds an assured market in the Eastern States and in Europe. This, of course, is in the same latitude as the best European apple districts, such as are found between Normandy and Lower Austria, penetrating farther south (with similar quality of fruit) only among the highland valleys of Switzerland.

The *orange* is probably a native of southern China, where it is still very largely cultivated and consumed; but it is most prolific in tropical and semi-tropical climates. As, at the same time, it is very widely consumed in temperate climates, it has a distinct commercial importance. As a native of a summer-rain climate, its acclimatization in the summer-drought climate of the Mediterranean area—from which the mass of the British supply comes—has been easy because of its love of bright sunshine and 'generous' soil; but the flavour of most of these 'Mediterranean' oranges is inferior to that of the 'West Indian', especially the Jamaican, fruit. A single tree in Jamaica may bear 10,000 oranges; and, as the crop begins to ripen as early as September, the fruit can reach the British market before even that from the irrigated parts of the Mediterranean, and is much sweeter than any artificially hastened fruit can ever be.

There is, however, a commercial element at work. For the transport of ripe oranges is very difficult and expensive; and, therefore—although the fruit has a wide distribution, e. g. from Paraguay to Japan and from New South Wales to

California—the most important of the producing areas are those which enjoy cheap and short transport to large and constant markets. This is the supreme advantage of the Mediterranean basin, e. g. Denia and Valencia, Sicily and Malta, Oran and Jaffa: and it has a further climatic advantage in the sensitiveness of the plant to frost. This, again, favours island-growers, who have also normally easiest access to cheap transport—on the great Suez route. It is a similar freedom from frost that has given California the advantage over Florida in orange-growing: for, though Florida grows the sweeter and juicier fruit, and is nearer great markets, she is exposed to occasional 'cold waves' from the Mississippi plain.

Spices.

The *spice* trade is, in some ways, more interesting for historic than commercial reasons. The demand for spices was relatively greater in days when the preservation of fish and meat for winter food depended entirely on the use of spice; and in those days there were enormous profits in the trade because of the extraordinary difference in the value of the product in its place of origin—a tropical island—and in the European market. Vasco da Gama's spice-cargo from India in 1497 yielding a profit of 6,000 per cent. The total production is probably as large as it ever was, if not larger, but there is no longer any monopoly—either by places or by persons, so that profits are smaller; and the supply can easily overtake the demand.

Nearly all spices are natives of S.E. Asia, nutmegs and cloves being specifically Molucca ('Spice Islands') products, while pepper—the most important of all—is specifically 'Indian', and cinnamon Cingalese. Nowadays the mass of the pepper imported into the United Kingdom comes from the Malabar coast or via Singapore from the Straits Settlements and the Dutch East Indies. Nearly all the ginger (also a native of S.E. Asia) comes from Jamaica, but cardamoms (the fruit, as opposed to the root, of a 'ginger') come still from the East Indies. Nutmegs, again, still come from the East Indies; but cloves, which are very sensitive to sea winds, come specially from Zanzibar and Pemba, mainly owing to the skilful way in which the Arabs have utilized the native labour and confined the islands to this single crop. The finest cloves, however, i. e. those used directly as spice, and not for distillation, still come from the East Indies, e. g. from Amboyna and Penang. Almost all real cinnamon, which—like ginger—demands a very rich soil, comes from Ceylon; pimento, which is content with very poor soil, comes from the 'barren lands' of Jamaica; and vanilla comes from the Seychelles and other islands in the west of the Indian Ocean. The most important spices that can be grown in purely temperate climates are mustard and caraway, both typically 'fen' products (cf. Lincolnshire mustard and Dutch caraways).

Sheep.

P. 56. *Sheep* and goats, for wool-making purposes, require a dry temperate climate tending to warmth, where the 'fat' is not needed, and consumed, to keep up the bodily heat. This accounts for the importance of 'Mediterranean' climates. The merino was a native of North Africa, greatly improved in Spain, and (after having been acclimatized in Saxony with still further improvement) eventually transferred with complete success to corresponding latitudes elsewhere—in Australia, South Africa, the Argentine, &c. The best merino wool is now very long in staple, quite unlike that of the original merino. Mutton, as opposed to wool, is the product rather of a damp climate, such as is typical of temperate islands; and, as the merino yields a very poor 'continental' type of mutton, the attempt was made to breed a 'cross' between the mutton-producing and the wool-producing types. All areas which export both wool and mutton, e. g. New Zealand, are bound to patronize largely this cross-breed; and the wool of cross-bred sheep is much less injured by dust-storms and blazing sun than the merino wool.

As typically montane fauna, sheep are naturally suited to rough pasture, and are able to travel long distances for their food; and, as their essential products before the days of refrigeration and cold storage were all more or less non-perishable (wool, tallow, skins, &c.), they were equally suited to remote or otherwise inaccessible areas, e. g. such distant areas as the Falklands (with 300,000 sheep per 1,000 of population), the Faroes, Iceland, &c. As they suit also both temperate lands that are too wet for the plough and temperate and warm-temperate and even sub-tropical lands that are too dry for the plough, their distribution is still farther extended. Again, though they are practically defenceless and so stupid that they need systematic supervision, this can be given—by the help of dogs—even in the most sparsely peopled areas.

These conditions explain their importance in the South Temperate Zone, where 40 per cent. of the world's flocks are concentrated. For it is remote and often difficult of access, it is largely too dry for the plough, and it is very sparsely peopled (not 12 per cent. of the world's population). Australia has *c.* 100,000,000 sheep, Argentina has over 65,000,000, British South Africa nearly 31,000,000, Uruguay over 26,000,000, and New Zealand fully 24,000,000. These figures, however, conceal some interesting contrasts, such as the large area of 10-inch rainfall in Australia, which cannot support more than 10 sheep to the square mile, and the area of 100-inch rainfall in New Zealand,[1] where 5 sheep can be supported on 1 acre. So, Uruguay reports an average of 350 sheep to the square mile (over a total area of 72,000 square miles) and over 25,000 per 1,000 of population; Australia reports an average of *c.* 30 to the square mile, and 23,000 per 1,000 of population; the Union of South Africa reports an average of 60 per square mile and 5,000 per 1,000 of population, and Argentina 60 per square mile and 9,500 per 1,000 of population.

In the North Temperate Zone, except for the British Isles, with their 30,000,000 (i. e. 250 per square mile and *c.* 650 per 1,000 people), all the large flocks are in areas that are entirely or partly semi-arid, remote or otherwise inaccessible, and relatively sparsely peopled, e. g. U.S.A., Russia, Turkish Asia, and Russian Asia. They report respectively over

[1] It is only scarcity of population that keeps New Zealand in the meantime so largely pastoral

50,000,000, nearly 50,000,000, *c.* 45,000,000, and nearly 40,000,000; but only in Turkish Asia is the distribution at all dense—60 per square mile and 2,500 per 1,000 people. The square mile maintains only 25 in European Russia, 14 in U.S.A., not 5 in Asiatic Russia; and the corresponding figures for the relation to population are *c.* 400, 550, and 850. These figures are given—not because any special importance should be attached to figures, still less to support the recent mania for Statistical Geography—but to suggest a line of comment on four important dates:

(1) Era of cheap cotton after Waterloo (1815);
(2) Era of cheap (rail and steamer) transport since 1850;
(3) Era of refrigeration and cold storage after 1900;
(4) Anticipated disturbance of wool-market (by excessive percentage of coarse wool) by 1915.

For the encroachment on the fine-wool areas by mutton-producing varieties of sheep threatens to leave the wool-market at the mercy of the Western-Asia growers, who give neither scientific knowledge nor even normal care to the development of their hardy native breeds. In the meantime, wool from areas which produce neither good mutton nor good wool, is used mainly for blankets (Indian) and carpets (Chinese).

Cattle.

P. 57. There is practically the same difference in quality between 'insular' and 'continental' beef as between 'insular' and 'continental' mutton; but, while the sheep is essentially a hill animal, *cattle* are essentially lowlanders, though the absence of large carnivorous beasts in mountain districts has favoured an abnormal 'survival' of cattle in many such districts. The value of land restricts to some extent the spread of pasture in densely-peopled countries, where the demand for milk and meat is greatest; and artificial means of preserving food have not yet completely revolutionized the natural distributions. For instance, cattle are raised in the United States, Germany, and the Plate region, mainly for meat; in India and South Africa for draught-work; in Russia and Brazil for hides, bones, and tallow; in western Europe and eastern North America specially for dairy purposes.

There are two main types of cattle, which, when well fed, develop on different lines, the one making meat and the other making milk; and while the former are associated essentially with sparse population, the latter are associated with dense population. In the latter case, obviously, there is not likely to be enough local food for both man and beast, so that the milch cattle are stall-fed on imported stuffs. Further, as there are no more vast plains still unoccupied in the world, while the population is steadily growing and steadily demanding more grain land, the ratio of meat to man is steadily falling; and the price of meat must, therefore, steadily rise. Thus, the percentage of cattle to population in the U.S.A. was 83 in 1890, 80 in 1901, and 62 in 1912; and there is some fear that the 58,000,000 head, which this 62 per cent. represented, may have fallen to 36,000,000 by the end of 1914. Certainly the exports of live cattle from the States, which totalled 600,000 in 1906, had fallen to 25,000 by the end of 1913; but this has been partly due to the development of refrigeration and cold storage. In any case, it is worthy of notice that the British Colonies have *increased* their cattle by 32 per cent. between 1901 and 1911—from 15,500,000 to 20,500,000—while their population increased only 28 per cent.

The total distribution of cattle in the four great continents in 1912 is estimated by Mr. W. P. Rutter as—

Asia, 143,000,000.	North America, 75,000,000.
Europe, 130,000,000.	South America, 76,000,000.

In this connexion Africa is negligible, for reasons already suggested (cf. p. xxxiii). The approximate regional distribution to-day, in millions, is probably—

India, 120 (being 25 per cent. of the total).
U.S.A., 50 (nominally 58,000,000).
Russian Empire, 50 (35 being in Russia proper).

Argentina, 29.	Brazil, 24.
Germany, 20.	Austria-Hungary, 18.
France, 14.	United Kingdom, 12.

Australasia, nearly 12.

Of the 130,000,000 in Europe, fully 30,000,000 are milch cattle; and the totals in the countries where the proportion of milch cattle is very important are, roughly—

Italy, 6,200,000.	Denmark, 2,250,000.
Sweden, 2,750,000.	Holland, 2,000,000.

Switzerland, 1,500,000.

As South America has a percentage of cattle to population as high as 150, and Australasia one of over 200, while that of Europe is only 20, further details for Australasian and South American units become specially important—

Uruguay, 8,500,000.	Queensland, 5,000,000.
Paraguay, 5,000,000.	N.S.W., 3,200,000.
Venezuela, 2,000,000.	Victoria, 1,700,000.

The United States give, perhaps, the best illustration of the various problems. In the eastern States, with their dense population, cattle are kept for milk and cream, especially in the most densely peopled area, i. e. New York State, with its red 'Devonian' sandstone and its admirable transport. The central 'Lake' States are also largely dairy areas, but more interested in butter and cheese, Iowa being the great butter area, while all the States between Iowa and New York (the second 'butter' area) are makers of cheese. These central States, however, include the 'Corn Belt', in which the fattening of cattle (and pigs) for meat purposes is a special industry; and the mass of these cattle for fattening come from the grassland 'plains' farther west. Cf. p. xxxvi.

In Europe the area of fertile soil with cool and humid climate which lies between the Channel and the Baltic, from Ireland and Brittany to Finland and Russia, is essentially a dairy district, where winter shelter and winter feeding are necessary; but the intensive tillage on the small farms supplies a large proportion of the fodder. Thus, in Denmark, 50 per cent. of the tillage area is devoted to cattle food—oats, roots, &c.—and over 70 per cent. of the harvest value (£30,000,000) is credited to that food. In the case of the Dutch, the draining of the polders for agriculture is prohibited by the terrific cost, but for pasture it is relatively easy and cheap; the Swiss have their Alp pastures above the

clouds in winter and below them in summer, so that the soil is cleansed and pulverized in winter and a very rapid growth of fine grass encouraged in summer; and Italy is essentially an irrigation area. Where transport is most difficult, cheese or condensed milk—as in Switzerland—are preferred to fresh milk and butter industries. The approximate position of the chief butter exporters is—

Denmark, 30 per cent. (200,000,000 lb.).
Russia (including Finland and Siberia), 23 per cent.
Holland, 11. Australia, 10.
France, 8. Sweden, 7.

Similar figures for cheese are—

Canada, 35 per cent. (180,000,000 lb.).
Holland, 24. Switzerland, 14.
Italy, 10. New Zealand, 8.

It would seem, therefore, that the meat-eating populations of milk-raising areas are going to be dependent almost entirely on the South Temperate Zone, especially on the Plate region and Australasia, for their supplies of both beef and mutton.

Hides and Skins.

The chief source of the raw materials of leather is, of course, the domestic animals—the hides of cattle and horses and the skins of sheep, goats, and pigs; but there are other sources of small supplies, both from sea and land, e.g. crocodile, whale, and various wild beasts. Difficulties of transport are almost negligible; for instance, a salted ox-hide is practically not capable of being damaged by any of the ordinary 'accidents' of transport, e.g. damp, dirt, rough usage. The special interest of the *Hides and Skins* chart lies, therefore, in tracing the connexion between the quantity exported and (*a*) the extent of cheap pasture-land, (*b*) the low price of labour, (*c*) the standard of agricultural science, (*d*) the distribution of tanning materials—Australasian hides and skins, for instance, generally coming to England ready tanned.

India exports, very largely, goat as well as cattle skins, and many goat skins come from other countries which have considerable areas of arid land, e.g. China, Mexico, Brazil, Italy, Morocco, the Cape of Good Hope, &c. Brazil, however, like the Argentine and Uruguay, exports mainly hides—the Argentine also exporting quantities of quebracho tan-extract. The export of skins from such countries as France and Belgium is partly due to the lack of tanning materials on the spot. On the contrary, it is the wealth of such materials in the U.S.A. that causes the very large import there: indeed, the States have an import very nearly as large as that of Germany (£20,000,000 a year *c.* £22,000,000), and its export of leather and leathern goods averages £12,000,000, while that of Germany averages £14,000,000.

Fish.

P. 58. Reference to the earlier Physical maps will draw attention to the importance in fishing industries of shallow sea, especially of large submarine banks (*a*) near enough to the surface of the sea to be covered with the seaweed in which the fish can find their food, lay their eggs, &c., and (*b*) near enough to deep water for the fish to be able to take refuge from storms and cold weather. The connexion should also be noticed of (1) cold currents with improved quality of product, and (2) warm surface-currents with distribution of the eggs, the current in the North Sea distributing them first to Scotland and England, then to Holland and Germany, last of all to Scandinavia.

The three great fishing areas are the North Sea, the North American Banks, and the 'Japanese' seas. All three have the typical estuarine facilities for spawning and the 'banks' or shallow 'bottoms' for feeding. In the aggregate the North Sea fisheries are the most productive, yielding specially herring, haddock, cod, and plaice; and much the most important unit on that sea is the British, the French coming second with a total catch averaging just half the value of ours (*c.* £11,000,000 a year). But much the largest single unit in the world is the Japanese,[1] with an average value of £15,000,000; and the catch of China and the neighbouring parts of the Asiatic mainland has a value fully half that of Japan, i.e. considerably higher than the French. The North American banks produce specially cod, herring, and halibut, the total Canadian catch being slightly more valuable than that of New England (£5,000,000); the industry in Newfoundland, though less valuable, is relatively more important, because it more or less monopolizes the whole population. There are several important centres, such as Lunenburg and Yarmouth, Gloucester and Eastport; but the natural concentration on the point of easiest access with the densest hinterland makes Boston the chief market. On the Pacific coast salmon and halibut are the special products, and distance from great markets makes 'canning' the natural mode of dealing with the catch, e.g. at such purely fishing-towns as Astoria. In connexion with all these real fisheries, as with the fisheries for oysters, sponge, coral, &c., artificial culture is becoming very important; the chief exports are from areas of relatively sparse population, e.g. Norway and Newfoundland; and the chief importers are Roman Catholic countries, especially in the Mediterranean basin and Latin America.

Wine.

P. 59. The *vine* is another of those products the distribution of which depends almost as much on economic as on climatic control. Its climatic range is practically dependent on the length of the summer and the natural sun-heat in the late summer and early autumn, successful cultivation (for wine-making) in Europe requiring an average maximum temperature of 60° F. in September. On the other hand, the severity of the winter is of little or no importance, the length of the root taking it beyond the reach of almost the severest frost, as it also takes it beyond the reach of almost the severest drought. The sun-heat must not be too great, or the wine becomes too syrupy; nor too little, or it becomes vinegary. The most appropriate site is, therefore, a slope of from 30° to 45°, facing rather eastward as well as sunward, in latitudes 40–50° N. and the thermally-equivalent 30–40° S.

[1] Including, e.g. bonito and cuttle as well as, e.g. cod and salmon.

Inside these limits wine-making is mainly confined to warm soils which are retentive of moisture, e.g. chalk, in lands where there is abundance of (*a*) capital, (*b*) skilled labour, (*c*) cheap chemical manures, insecticides, &c. France is far the most important country in amount produced (some 1,340,000,000 gallons off 3,900,000 acres in 1912), amount consumed locally, and amount exported; but Italy has much the largest area under vines (some 7,000,000 acres more than the French area), and the total estimated value of the crop is greater than that of the French. The diagram needs, therefore, to be interpreted in the light of two further facts—(*a*) that the amount of alcohol in 'Mediterranean', i.e. 'summer-drought', wines is at least 50 per cent. higher even than that in French wines, and (*b*) that only some 2 per cent. of the total production of French wines can be graded higher than *vin ordinaire*.

A careful study of the climatic conditions round Cognac and Cadiz will suggest reasons for sherry being the richest of all wines in organic ethers, and for French brandy having a higher percentage of such ethers than any other so-called brandy.

For causes mentioned in connexion with the European areas (cf. p. xvi), wine-growing has not progressed rapidly in new countries, least of all amongst wine-drinking peoples, though 'Spanish' vineyards round Santiago supply a large proportion of the Chile demand, and 'French' vineyards have had somewhat similar success in Argentina, e.g. round Mendoza and San Juan. The greatest progress has been made in the U.S.A. and round the Black Sea, especially in south-west Russia and Roumania. In the States the great 'wine' area is in the 'Mediterranean' climate of California, where Italian labour is plentiful; some wine is also made in the 'Lake' climate to leeward, i.e. eastward, of Lake Erie; but table grapes are the most important product. Similar economic causes favour the export of fruit rather than the making of wine in the 'Mediterranean' climate behind Cape Town, where of course the grapes ripen in our winter.

Tobacco.

Tobacco, as a native of tropical America, obviously must like heat and humidity: but it is a hardy plant—though sensitive to frost—and most of the tobacco of commerce is raised in distinctly temperate latitudes. In all cases, however, it thrives best on a light soil that is rich in lime and humus, especially if potash is also present in abundance. The ideal site, therefore, would be a coral-girt volcanic island in the Tropics; and the best-flavoured leaves of temperate regions come from areas of (once forested) limestone within 40° of the Equator, or from subtropical valleys covered with weatherings from crystalline rocks rich in potash.

The best cigars must be made from the fresh leaf—one reason for purely 'marine' tobaccos, e.g. from Cuba, Sumatra, Manila, being used specially for cigars. On the contrary, most imported leaves will be used for pipe tobacco, manufactured where they are imported; and for this purpose purely 'continental' tobaccos are specially suitable, e.g. products of the Ohio, the upper Danube, the upper Garonne districts. 'Semi-marine' tobaccos, especially from areas of summer-drought and winter-rain, e.g. the Syrian, Anatolian, and Turkish coastlands, and the delta of Egypt, like that of Virginia (U.S.A.), where leaf of very light shade is produced, are most suitable for cigarettes. In each case, however, the quality of the leaf varies with the soil—excess of lime, for instance, giving quantity at the expense of quality, while excess of clay, e.g. in Chinese loess, gives a very light yellow leaf that has practically no taste at all. The percentage of nicotine seems to be a climatic result, varying from 2 per cent. in a good 'marine' leaf, e.g. from the Vuelta-abajo of Cuba, to 9 or 10 per cent. in a common 'continental' leaf, e.g. from south-west Germany. Latitude here is of importance, the coarsest and least aromatic tobaccos coming from the continental belt of Eurasia, where the July temperature varies from 65° F. to 75° F.

The States are not only the largest producers, but also the largest exporters, supplying specially the British market; the main crop of the Dutch East Indies, the next largest exporters, goes naturally to Amsterdam: and extensive German colonization in southern Brazil seems to have helped to centre the export of Brazil, the third largest exporter, on Bremen. Though the growth of tobacco is extending most in the Rio Grande do Sul area, where the German population is densest, the main crop is still connected with Bahia.

Cotton.

P. 60. *Cotton*, like tobacco, has a considerable climatic range, though it too is sensitive to frost; and it grows best on light limestone soils in warm, moist, even climates, where the summer is long, and where there is salt in the soil or in the air. It is the most important of all 'subtropical' plants, and has a wide climatic range, much more than half the total crop in the world being grown in temperate latitudes. The largest amounts are grown in China and the United States, i.e. essentially 'continental' areas; but the finest quality comes from 'marine' climates, e.g. the sea-islands along the U.S.A. coast between Charleston and Savannah, the Nile delta, and various islands just inside the tropics, where the heat is not excessive, e.g. the Fijis. The U.S.A. 'Sea-island' cotton is gathered from the *Gossypium Barbadense* plant, and Barbados and other West Indian islands a century ago provided far more than half the total crop of the world. Brazil cotton resembles West Indian in length, but the excessive heat makes it much coarser; the short-staple Indian cotton suffers also from excessive heat and from want of bright sunshine during the Monsoon summer; the fine and long Egyptian product profits by abundance of bright sunshine, while the water-supply is regulated by irrigation.

As to the increase of supply in the future, the Eastern and Central Sudan can grow unlimited quantities of cotton of the Egyptian type, the West Indies are in the same position with regard to sea-island fibre, and Northern Nigeria, Nyasaland, and Uganda can do the same with cotton of the American 'Upland' type. But a high relative humidity

is more useful than the finest irrigation works; total amount of rainfall is of no importance compared with its seasonal distribution, rain in spring being essential to the development of stem and leaf, while rain in late summer—such as is typical in many parts of West Africa—diverts energy from the production of bolls, if it does not actually rot the pods; on the contrary, a fall in temperature, especially if accompanied by a fall in humidity, diverts energy and accumulated food to the perfecting of the bolls and away from the production of wood; and islands have obvious advantages in the matter of transport and freedom from frost, optimum temperature up to flowering being over 60° F. and under 70° F., while from flowering to harvest it is over 70° F. and under 80° F.

The great variety of uses to which cotton is now put demands a great variety of grades and types of the fibre; and though the States are still the great producer, the export is relatively falling off. The bulk of the U.S.A. supply is of 'American Upland'; it forms about 60 per cent. of the whole output of the world; and it is in demand everywhere, even in India and Japan. It spins coarser yarns—up to 40's.[1] The large Indian crop is still coarser, but very little comes to England, the bulk being used in India and Japan. The fine grades of 'American Long-staple' and 'Brown Egyptian', which spin up to 60's, are quite insufficient in quantity to meet the natural demand; and, at the same time, the quality—at all events of the Egyptian types—is not improving. Georgia and Carolina 'Sea-island' type and the best Egyptian spin up to 80's or 100's; and the real 'Sea-island' will spin up to 300's.

As the spread of civilization and the rise in the standard of living in civilized countries are increasing the demand for both the main types of cotton, there is serious need for expanding the areas of production; and in this connexion it is important to notice (*a*) that primeval cotton, like primeval man, was arboreal, and that the supply of tree-cotton might be greatly increased, e.g. from the Calicut coastlands; (*b*) that Trade-wind climates, with their slow changes of heat and humidity, are really more favourable to quality than 'Irrigation' or Monsoon climates; (*c*) that there are areas known to have climate and landward position very similar to those of the 'American Upland' district, e.g. behind the scarp of the East African plateau; (*d*) that it is quite easy—though, of course, it requires time—to improve by proper selection all good native cottons, wherever found, e.g. in Nigeria. And the really important thing would seem to be to distribute, not seed, still less poison (for pests), &c., but trained agriculturists, to superintend the selection of seed from indigenous plants and to improve gradually the general methods of native cultivators.

It may be said at once that the outlook in India is not promising—apart from tree cotton. The land is needed for other crops; inferior kinds *pay best* from the native's point of view; and India is a buyer of cotton. Time and care could no doubt reproduce eventually the type of fibre out of which the old Dacca stuffs were made—from yarn hand-spun up to 300's! But it would not pay for cultivation under present conditions.

Russian Asia, with fairly cheap labour and land, but costly irrigation and transport, is becoming more and more important, and so relieving the pressure on ordinary American Upland. At present only about one-third of the available U.S.A. area is being used for cotton, but any extension must depend on the profits of the crop and on the supply of labour; and any extension at present is more likely to be in the direction of Long-staple kinds, especially with the falling off in the supply of the competing Egyptian kinds (Afifi and Ashmouni). Serious efforts, however, have been made to deal with the causes of the falling off—in both quality and quantity—in Egypt, e.g. insect pests, deterioration of seed under the bright light, too short a rotation (two years), over-watering, and deficient drainage.

Peru and Brazil, which produce good quality, and China, which produces poor quality, have been the three exporters of subordinate rank; but both China and Brazil are likely to need more and more of their own supplies at home, and British Africa is on the high road to displace all three as an exporter. Last year (1913) Uganda alone exported *c.* 10,500,000 lb., out of *c.* 15,000,000 from our Eastern possessions; and nearly 8,000,000 lb. were exported from the Western possessions.

The bulk of the fine cotton already comes from Egypt, and there is no great prospect of largely increasing the supplies from that source; but a small increase would be very useful, and there is great hope of the Sudan producing large quantities within the next ten or twelve years. Of the very fine cotton there is no real scarcity; and in the case of the real 'Sea-island' the danger, if any, is of over-production.

Rubber.

The sources of crude *rubber* (including balata and gutta-percha) are still mainly South and Central America, and the price of all rubber is still regulated by that of fine Pará[1]; but there are several important varieties of rubber-producing plants,—some of them growing in healthy climates, and 'plantation' rubber is every day becoming relatively more important than 'wild' rubber.

The States of Pará and Amazonas supply about half (46 per cent. in 1912) the world's total—all 'wild', from the vast forests of hevea; but the proportion which comes via Manáos includes supplies from Ecuador, Peru, Bolivia, Colombia, and even Venezuela. All these countries, however, except Venezuela produce quantities of castilloa rubber—from a tree indigenous throughout Central America, growing to twice the height of the hevea (80 feet), and more accessible from the ocean than the 'impenetrable' Selvas. On either side of the Selvas, i. e. on higher, drier, cooler, and therefore healthier land, the manihot tree produces Ceará rubber, exported specially from Maranhão and Bahia as well as

[1] The fineness is measured by the 'count' of the number of hanks (840 yards long) which go to the lb.

[1] As a matter of fact the Pará *area* does not produce the finest rubber, which comes from the valley above the head of tide, i. e. west—generally a good deal west—of Santarem, for the tidal inundation of the 'deltaic' islands is adverse to quality.

from Ceará; and this tree is the source of most of the 'plantation' rubber from Uganda and other parts of East Africa. Still more able to resist drought is the quayule—which grows on poor and stony soil in areas of very small rainfall (12 inches), and is even injured by irrigation. As a typical semi-desert plant, it is a fleshy herbaceous bush of dwarf habit and of sunflower type; but the fact that it can grow well up to a height of 6,000 or 7,000 feet in such areas as Arizona and New Mexico gives it special importance. In parts of Mexico indeed, e. g. in the States of Durango and Coahuila, it has given a sudden and substantial value to miles of waste land. Unlike the manihot, which grows with exceptional rapidity for a 'dry' plant, it matures slowly; but it grows in a much healthier climate, and occupies land practically useless for any other purposes.

Africa presents a somewhat similar picture to Central and South America, but the types of plant are different. The wet jungle of the Congo basin shows its physical difference from the Selvas by producing rubber from lianas; on the higher and drier land round the basin the indigenous source of supply is the funtumia (tree), which is largely used now in plantations; and where regular planting is being developed on thoroughly scientific lines, the best types of South American plants are being cultivated, e. g. manihot on the eastern plateau and hevea on the coastlands of Madagascar.

In the East Indian area the indigenous plant is a fig-tree—also at home in the West Indies; but, except in Annam and in parts of the larger islands, the whole area is practically devoted to hevea. In Ceylon during the present century the acreage under rubber has increased from 2,000 to over 200,000, and in the Malay peninsula—where the very evenly distributed rainfall is as favourable as the abundance of cheap labour—it has increased to 400,000. Indeed, Britain owns a larger acreage under plantation rubber than any other Power in the world; and the Dutch East Indies, which come next in area, are far behind in the *age* of the plantations—this being reflected in 1913 by a production of 35,000 tons of Malay and 11,000 of Ceylon rubber against 3,500 from Sumatra and only 1,750 from Java. About a quarter of the commercial supply is now of plantation growth; and, of course, this affects most the areas where the natural products are less fine and less prolific than those of hevea type. That is to say, Africa will be affected more than South America.

Flax.

Flax grows best on soil that has been fertilized for ages by the decayed leaf-fibre of deciduous forests, and it exhausts the soil so much that there ought to be at least a five-year rotation—the British being generally a seven-year one; but its essential product varies with the mean temperature, the fibre being very poor where the seed produces good oil. In Russia it has the largest area of any crop, partly because it is grown for oil to satisfy the demand for a vegetable food—in place of butter—during the fasts of the Greek Church. The fibre is, therefore, in the nature of a by-product; and Russia is thus able to supply nearly four-fifths of the world's demand for the fibre. But Calcutta is—or has been till recently—the great linseed-oil market. The finest fibre is grown on the alluvial soil of Flanders, where too the quality of the water, especially in the Lys, is very favourable to the retting of the fibre; but that grown in the Po delta, especially round Cremona, is also very good. The plant requires a great deal of cheap labour both on the field and—for fibre—in its earlier manufacturing processes; and this accounts both (*a*) for its wide cultivation in Northern Italy, Russia, and other countries where labour is cheap, and where the standard of civilization is so low that women are expected to do hard out-of-door labour, and (*b*) for the fact that, where labour is dear, the plant is grown for oil even though the climate is really unsuitable, e. g. U.S.A. As the inset diagram shows only the production of the fibre, it does not indicate the commercial importance of the enormous areas under the plant in the Argentine and the United States, still less in India, which exceeds even Russia (including Poland) in the acreage under flax—though far behind it in the quantity of seed[1] produced. The values of the linseed and the flax imported annually into the British Isles are almost exactly the same (*c.* £4,500,000); but while half the seed comes from India and a quarter from Argentina, more than three-fifths of the flax comes from Russia, and one-third from Belgium. Cp. pp. xvii and lxiv.

Hemp.

Hemp is grown under very similar conditions, but has to be produced even more cheaply. Russia, again, supplies most of the fibre, while the best comes from the Bologna district of Italy; and, again, 'Monsoon' Asia supplies the other products of the plant, mainly various stimulants. The henequen, or so-called 'hemp' exported from Yucatan via Sisal, is an agave product; and the Manila 'hemp' of the Philippines comes from a kind of plantain. Russia practically controls the market for hemp—both fibre and seed.

Timber.

P. 60[A]. The distribution of *timber* is essentially climatic, for the basis of all forest growth is a combination of three conditions—(*a*) a warm growing season, (*b*) a calm resting season, and (*c*) a subsoil that is always damp. The last is of special importance in the tropics, where there is seldom any deficiency of heat; and the calm resting season or 'winter' is of the most importance in high latitudes—drought having the same influence as low temperature—because wind carries off more moisture than the transpiring tree can replace from its frozen or droughty site. This explains the existence of forest in Siberia round the Pole of Cold, with its minimum of *minus* 92° F., but with absolute calm in the centre of the consequent high-pressure area.

Though teak is perhaps the most valuable timber in the world, and though tropical timbers generally are noted for the typical heat-control of colour—illustrated also by such summer-drought woods as walnut, olive, and yew—the great

[1] The percentage for the three great seed-producers is: Argentine fully 40, U.S.A. 26, Russia fully 20; India varies most unsatisfactorily—from 7 to 17.

bulk of the timber used in the world is from conifers, which are (*a*) soft enough to be easily worked, (*b*) so impregnated with resin as to be durable, and (*c*) usually situated where they can be exploited over snow.

Much the largest areas of timber are possessed by Russia (850,000,000 acres, seven-tenths being in Europe), Canada (800,000,000), and U.S.A. (650,000,000, fully one-sixth being in Alaska); and these three countries, with Sweden, Austria-Hungary, and Norway, are the only important exporters. Already, however, the U.S.A., Austria-Hungary (only 50,000,000 acres), and Russia proper, are in sight of a limit, the U.S.A. annual cut being $3\frac{1}{2}$ times the annual growth; Norway (only 17,000,000) and Canada both over-cut, and forest fires[1] in Canada in some years destroy four or five times as much as is cut; only India (150,000,000 acres), the Finland (50,000,000) and Siberian parts of Russia, and Sweden, cut less than is grown.

In the near future, then, the great commercial supplies are likely to come from (*a*) the Baltic area, (*b*) the very similar Laurentian area, and (*c*) British Columbia, which lacks the glacial soil and deep snow of the other areas, but which began proper forestry before beginning real lumbering, and which cuts only one-fifth of the annual increase. The typical trees of this Pacific 'North-West' are the Douglas fir and Oregon pine; and in the Laurentian area they are white pine, spruce,[2] and hemlock. In the States, however, the cut of yellow pine from the S.S.E. area is nearly three times as large as the cut of Douglas fir, and four times as large as that of white pine or hemlock. This accounts for the steady decline in the importance of the North-eastern States and the equally steady rise in that of the South-eastern, Louisiana standing next to Washington for total cut, and Mississippi coming third. Indeed, Wisconsin and Michigan are the only large producers representing the Laurentian area; and they are, of course, Lake, not North-eastern, States.

Amongst the tropical areas that are darker-coloured on the map, purely 'equatorial' climates produce typically such woods as rosewood and ebony; Trade-wind climates produce specially mahogany (the 'Spanish' or West Indian being the best); the Monsoon climates produce teak, especially from Farther India. The Australian timbers—in almost tropical heat, but with lack of moisture—grow so slowly that they are intensely hard, and they show the influence of heat in rich colour; but for cabinet purposes their lack of branching makes them lacking in 'figure', and for constructional purposes they lack 'fibre' and tenacity. In the latter respects 'Monsoon' timber—grown with great extremes of high humidity and low humidity—is unique, teak having also an essential oil which prevents rusting when the wood is in contact with iron.

Silk.

The various factors in the production of *silk* have already been discussed at length (cf. p. xvii); but the three-fold classification of the map is useful, especially when related to the *value* of the various crops. Thus, China seems to be the largest producer and the largest exporter of silk[1] only so far as actual quantity goes; Japan, with a total production approaching that of China, has an average export less in quantity by 10,000,000 lb. than the Chinese, but valued at £2,000,000 more; and Italy, with an export 5,000,000 lb. less than the Chinese, has a value £10,000,000 higher. This implies a small export of 'waste', i.e. the particular material used in the British silk industry (plush). The western Asian production, though distributed over a very large area, has neither the climatic nor the economic advantages of the densely-peopled Monsoon countries, with their old civilizations and luxuriant vegetation. It is noteworthy that two of the three great importers of raw silk (France, over 40,000,000 lb.; U.S.A., over 20,000,000; and Italy, approaching 20,000,000), are themselves large producers of it; but it must be remembered that both have a very large re-export, France re-exporting *c.* 50 per cent. of what she imports.

Dairy Produce.

P. 60[B]. The maps on this page are largely supplementary of those on maize and cattle above, illustrating particular aspects of the wider problem; but one or two details may be emphasized. Generally, conditions unfavourable to cattle are favourable to *pigs* in middle latitudes; but pigs are closely associated with both (*a*) that rearing of cattle (for meat) which depends on extensive agriculture, e. g. maize-growing, and (*b*) that rearing of cattle (for milk) which depends on intensive agriculture or the import of fodder. Indeed, the Danes have proved that a *dairy* industry is the best possible way of keeping population on the land and using the land to its maximum value. Again, poultry—on a large scale—are as closely associated with grain-growing as pigs are, though the latter are naturally forest fauna. In the south of Europe, as in the south-east of the U.S.A., pigs are still largely forest-fed, and 'forest-fed' pigs are actually the chief export of Servia; but in each case the oak and beech forests are interspersed by valleys rich in maize.

It is the exceptional value of maize as a fattening food that accounts for the overwhelming importance of the U.S.A. in the distribution of pigs, with well over 40 per cent. (*c.* 65,000,000) of the total world's supply, and the high percentage of well over 700 per 1,000 people. But the U.S.A. pigs are, for this very reason, essentially 'lard' animals, not 'bacon' animals. The latter, though much fewer in number, are much the more valuable, and are the natural product of the barley lands of 'summer-rain' Europe. These lands are found specially round the Baltic and North Seas, though Eastern Canada in this—as in so many other respects—resembles the north-west of Europe. Germany, with about one-third as many pigs as the States, is much the most important, but has a characteristic import of lard—to the value of *c.* £4,500,000 a year; and, of

[1] The use of oil-fuel in the locomotives is greatly decreasing the loss from fire.

[2] Spruce, poplar, and aspen are trees specially used in the wood pulp industry (for paper).

[1] The Chinese figures are far from satisfactory, but silk-rearing is certainly a household industry over an area larger than the whole of Japan.

course, she cannot compete with Denmark and Holland as an exporter of bacon.

The three great exporters of dairy produce—Canada, Denmark, and Holland—have rather different lines of trade, Canada specializing in cheese and Denmark in butter, while Holland pays about equal attention to both. The same is true of the minor exporters—Russia, Australia, and Sweden specializing in butter, Italy and Switzerland in cheese, while New Zealand and France export both. Russia, Denmark, and Italy are also the great egg-exporters.

Pp. 61–64. These mineral charts, though useful in giving a bird's-eye view of the general distribution of the minerals, are of little educational value unless they can be studied in reference to geological maps of the various areas. That would at once draw attention to the importance of areas where tough, old metal-bearing scarps are flanked by rock which is near to them in geological time as well as in geographical space, for these are nearly always rich in fuel, as e.g. at St. Étienne and Liège.

Coal.

P. 61. *Coal* is always found along with sediments which have been laid down under water, but close to dry land; and generally a seam is overlaid by water-bearing sandstone, and underlaid by impervious slate or clay. The outcrop is, therefore, often marked by a line of marshy ground; and the presence in the neighbourhood of fossils of 'Carboniferous Age' is a reasonable guarantee of the presence of coal underground.

The actual production of the three chief countries in 1912 was approximately—U.S.A., 470,000,000 tons; United Kingdom, 260,000,000; Germany, 170,000,000. All the rest of the world did not produce more than 200,000,000, France contributing one-fifth of the amount; but some of the smaller producers are of considerable importance, mainly because of their geographical position. Thus India can be relied on for fully 15,000,000 tons, while Japan produces rather more, and Canada rather less than that; Australia (including the Wonthaggi district of Victoria) raises nearly 12,000,000, and the Union of South Africa over 7,000,000. Great Britain exports more than all the rest of the world put together, her average export of over 60,000,000 tons being larger than the combined imports of France, Germany, Austria-Hungary, Holland, and Italy; and it is the certainty of getting a return cargo (of coal outwards and food-stuffs and other raw materials inwards) that gives us such immense advantages in world transport. The United States is much the largest consumer (460,000,000 tons in 1911), the average for the last three years being greater than the combined consumption of the United Kingdom, Germany, France, and Belgium.

Iron.

Although the *iron* map is essentially concerned with the distribution of ore, its most important features represent the present condition of the iron industry generally, for the chief raisers of ore are also the chief producers of pig iron and of steel.

France approaches the British Isles in her production of ore, but is far behind for pig iron and steel; Russia stands next to France for both the pig iron and the steel, but is not much above Sweden, and is considerably below Spain, in the raising of ore; and Belgium, as a manufacturer, is really more important than France or Russia.

Country.	Ore (tons).	Pig Iron.	Steel.
U.S.A.	48,000,000	24,000,000	23,000,000
Germany	27,000,000	13,500,000	13,000,000
British Isles	15,500,000	10,000,000	6,000,000

Industrially, the fundamental demands for vast capital, abundance of skilled labour, a large market, and cheap transport to that market, have debarred other countries in the meantime from competing with even the second group of producers (Belgium, France, and Russia), still more from competing with the first group (U.S.A., Germany, and the British Isles). On the other hand, obvious changes are already in progress. For instance, a country such as Sweden, with vast supplies of fine ore, charcoal-fed furnaces, and unlimited water-power for electric smelting, becomes relatively more important every year; and China, with her vast supplies of skilled labour as well as of good coal and fine ore, has still greater, if not so immediate, advantages. Already the States are importing Swedish and Spanish ores, partly because the Lake Superior deposits are decreasing in quality and becoming more expensive to work, and partly because they are cut off—by ice—from water transport for part of every winter. And the position of Russia, on the other hand, is improved by its partial monopoly of manganese (fully 40 per cent. of the total), India and Brazil being her only serious rivals.

Precious Metals.

P. 62. In the case of *metals*, the beds of ore, e.g. of gold and magnetic iron, are largely the result of volcanic action, occurring in volcanic matter deposited in water, while the true veins, e.g. of copper, silver, lead, are largely the result of plutonic action, having been filled by sublimation, i.e. the temporary vaporizing of the metal in the original state, or some similar process. The common metals are found in rocks of every geological age, but are seldom found pure.

The Transvaal holds a position in the *gold* industry similar to that of Russia in the manganese, producing fully 40 per cent. of the total supply, while the U.S.A. produce about 21 per cent., and Australasia produces about 13 per cent. The only other serious producers (in 1911) were Mexico and Russia, with respectively rather more and rather less than 6 per cent. The relative decline of Russia illustrates (*a*) the importance of capital and transport facilities, (*b*) the increased difficulty and cost of working reef gold, and (*c*) the folly of boycotting Yellow labour.

As the map suggests, *silver* is largely a by-product, the great bulk of the supply coming now from mines which are only incidentally worked for silver—being worked primarily for lead or copper, or even gold or zinc. The ease with which

silver can be worked, or rather crushed—on a stone floor by a stone mill—in a dry and rugged country, has for ages kept Mexico the head of the silver-producers, producing about as much (*c.* 90,000,000 oz.) as the U.S.A. and Canada combined. Australia, with 17,000,000 oz., has about half the output of Canada. North America thus is responsible for fully 70 per cent. of the world's supply, while South America is almost negligible, even Peru only contributing 8,000,000 oz. a year now: and it is noticeable that, although the greater part of the world's commercial transactions are still conducted in silver—dollars, francs, marks, roubles, rupees, &c., the total value of the world's silver is under £27,000,000, while that of the copper is over £50,000,000, that of the gold is £100,000,000, and that of the pig iron is nearly £200,000,000. The total output of silver also remains practically stationary, for increase of supply is reflected very rapidly in decrease of price.

The *lead* diagram, being an average, does not draw attention to the marked rise of Mexico in this as in other mining industries, owing largely to the extension of railways into the country from the U.S.A.

Oil.

P. 63. The chief *vegetable oils* have been treated in detail, with special reference to their climatic distribution, in Part II; but no emphasis was laid there on their actual importance in our own commerce. It is therefore worth noticing that, in various forms (seed, oil, cake), we import linseed sometimes to a value of over £6,000,000 a year, cotton seed to a value of over £5,000,000, and both palm oil and coconut oil to at least half that amount.

Petroleum—and the same is true of natural gas—is generated by accumulations of organic remains, similar to those which are the source of coal; these accumulations are found in porous rock, e.g. coarse sandstone, but the impervious layer (of clay) is above, not below, so that the resultant fluid has not escaped to the surface. These conditions are well illustrated in the 'geological' youth of the great oilfields of the world and their essential impermanence.

The U.S.A. are still supreme in the petroleum industry, with 64 per cent. of the total supply, including all types of oil—fuel, lighting, lubricating, &c.; but the chief centres are constantly changing (cf. p. xlii). Russia, though still producing 20 per cent., is declining in importance. Mexico, though only accounting for 4 per cent., is rapidly increasing in importance—for fuel oils; for there are oilfields along the whole of her most accessible coast, specially near Tampico, Coatzacoalcos, and Tuxpan, where one well has often yielded *160,000 barrels a day*. The Dutch East Indies, which are nearly as important as Mexico, produce specially benzine oils—along the northern coastlands of Sumatra and the eastern coastlands of Java; and the field seems to be more or less continuous in both directions, e.g. into Borneo and into Burma, where the yield is good but the quality poor. A somewhat similar stretch is found along the skirt of the Carpathians, specially in Roumania, where the output is steadily rising, and in Galicia, where it is steadily falling—the ominous intrusion of water almost certainly pointing to a failure of the gas-pressure in the oil reservoirs.

The most promising new area is Peru, where oilfields exist along the whole of the western slope from north to south; the product ranks higher than the U.S.A. for lighter distillates (e.g. kerosene and gasoline), and probably next to Russia for high-class lubricants. Two of the chief areas reach the coast near Payta and Tumbez. The British Empire, though not producing more than 1,250,000 tons (out of a total of *c.* 50,000,000), has its supplies very well distributed—in Burma and Assam, in Borneo and in the Red Sea (Jemsah), in Trinidad and Barbados, in Canada and Newfoundland.

Copper and Tin.

Much the richest *copper* district in the world lies between longitude 110° and 112° W. in the Rocky Mountains. This includes the great U.S.A. mines, e.g. those which centre on Helena (Butte City, Anaconda, Great Falls) and those which centre on Tucson (Bisbea, Morenci, Globe), and the great Mexican mines in Sonora and Lower California, where the chief district is that of Boleo. Mexico, however, with over 70,000 tons a year, is far behind the U.S.A. (550,000), and now not much ahead of Japan (65,000) and Spain (59,000)—two-thirds of the Spanish output coming from Rio Tinto. Canada is now ahead of Germany; and Peru, the Belgian Congo, and Russia are rapidly becoming more important, while Alaska and Yunnan are known to be very rich in the metal.

Although *tin* is regarded popularly as a common metal, it is quite the reverse; and its price is three times that of its main substitute, aluminium. The supply comes practically from only three areas—the Straits Settlements (*c.* 55 per cent.), Bolivia (*c.* 22 per cent.), and a corner of the Malay Archipelago (15 per cent.). Of the other areas, England raises rather more, and both Australia (including Tasmania) and Yunnan raise rather less, than 4 per cent. As mining in Bolivia is still conducted in a very primitive manner, e.g. the veins worked by hand and the metal marketed on llamas, there may be still greater progress made; but the only other really promising area is the Transvaal (2 per cent.), though Nigeria (*c.* 1 per cent.) is fairly promising.

Gems.

P. 64. Examination of the map will show that the distribution of *precious stones* is markedly regional; and, in spite of a considerable variety of stones in Australia and U.S.A., there are only four important regions—(*a*) the diamond district of South Africa, to which geologically the east of Brazil belongs, (*b*) the ruby and sapphire district round the Bay of Bengal, specially in Ceylon, Burma, and Siam, (*c*) the Muso emerald district of Colombia, which—like the much less important district of Venezuela—will almost certainly be traced back some day into Peru, and (*d*) the opal district of Hungary, with its annex in Saxony.

The best *pearls* still come largely from the old centres of the Manaar Gulf and the Bahrein Islands, but very fine ones come also from the Sulu Islands and from the Gulf of California. It is only in the Chinese rivers that the culture of the pearl-mussel is really important, as it is only in the 'Mediterranean' region—especially along the 'Saharan' coast—that the pink coral is of commercial importance.

LIST OF MAPS

WEST INDIES, &c.

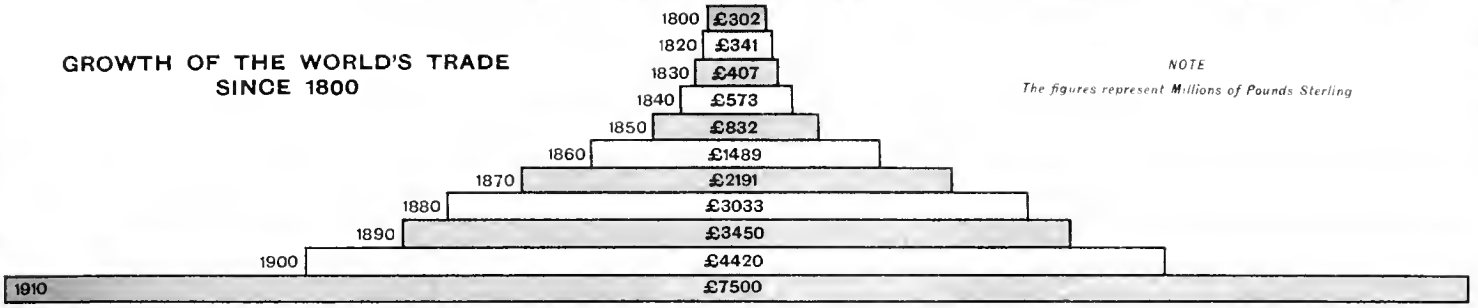
AUSTRALASIA

COMMERCIAL PRODUCTS

MAPS

COMMERCIAL GROWTH OF NATIONS

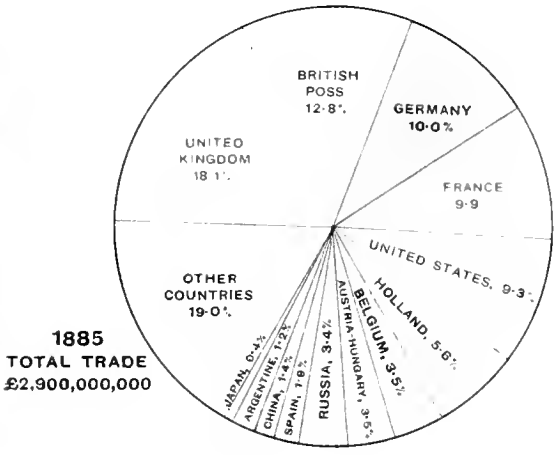
GROWTH OF THE WORLD'S TRADE SINCE 1800



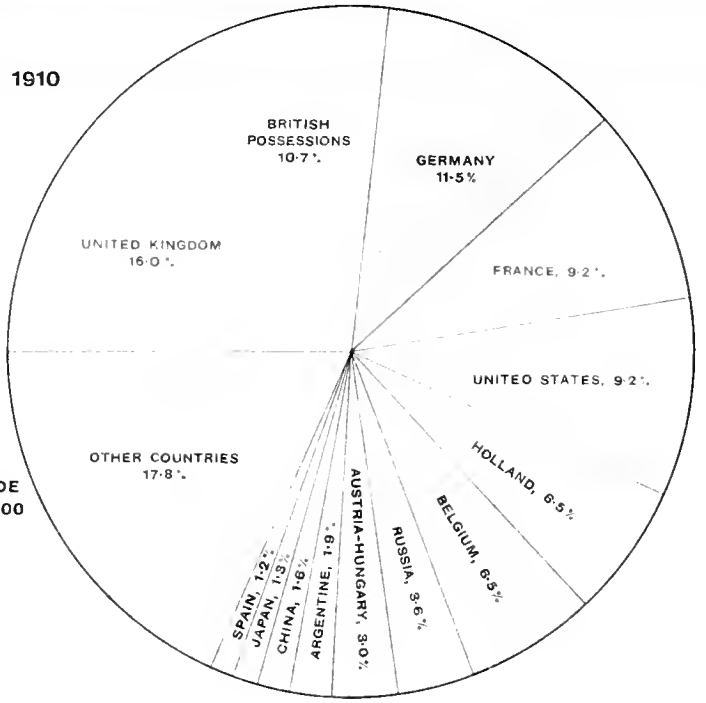
NOTE

The figures represent Millions of Pounds Sterling

PROPORTION OF THE WORLD'S TRADE HELD BY DIFFERENT NATIONS IN 1885 AND 1910



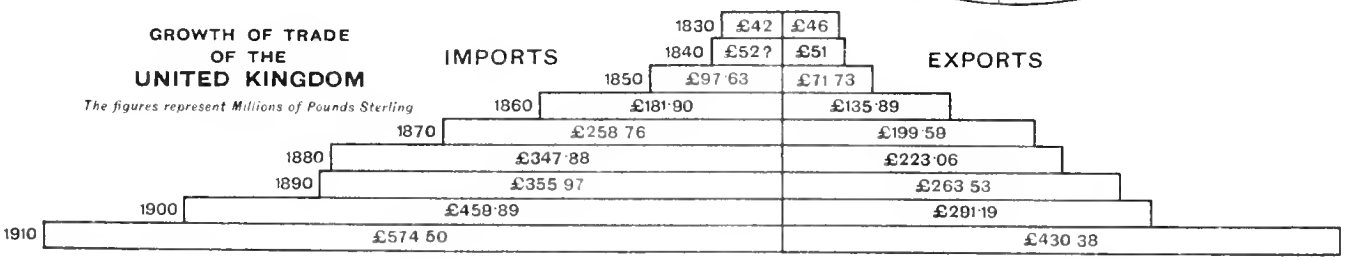
1885
TOTAL TRADE
£2,900,000,000



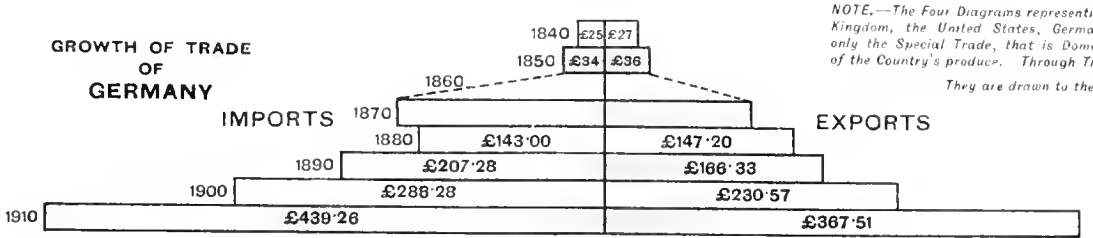
1910
TOTAL TRADE
£7,600,000,000

GROWTH OF TRADE OF THE UNITED KINGDOM

The figures represent Millions of Pounds Sterling



GROWTH OF TRADE OF GERMANY

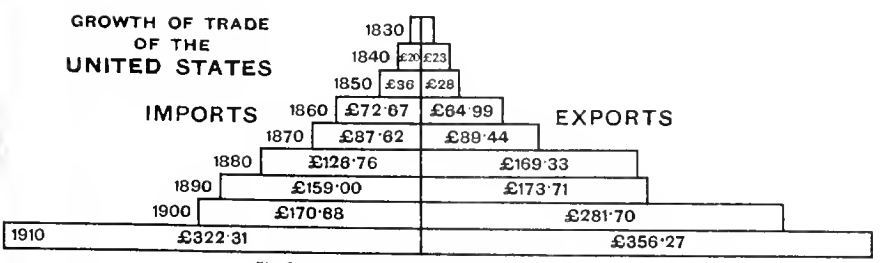


The figures represent Millions of Pounds Sterling

NOTE.—The Four Diagrams representing the Trade of the United Kingdom, the United States, Germany, and France, include only the Special Trade, that is Domestic Imports and Exports of the Country's produce. Through Trade is not shown.

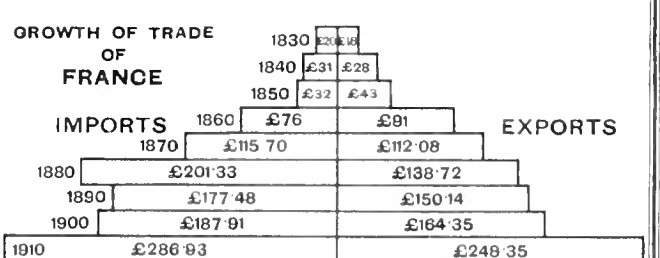
They are drawn to the same scale.

GROWTH OF TRADE OF THE UNITED STATES



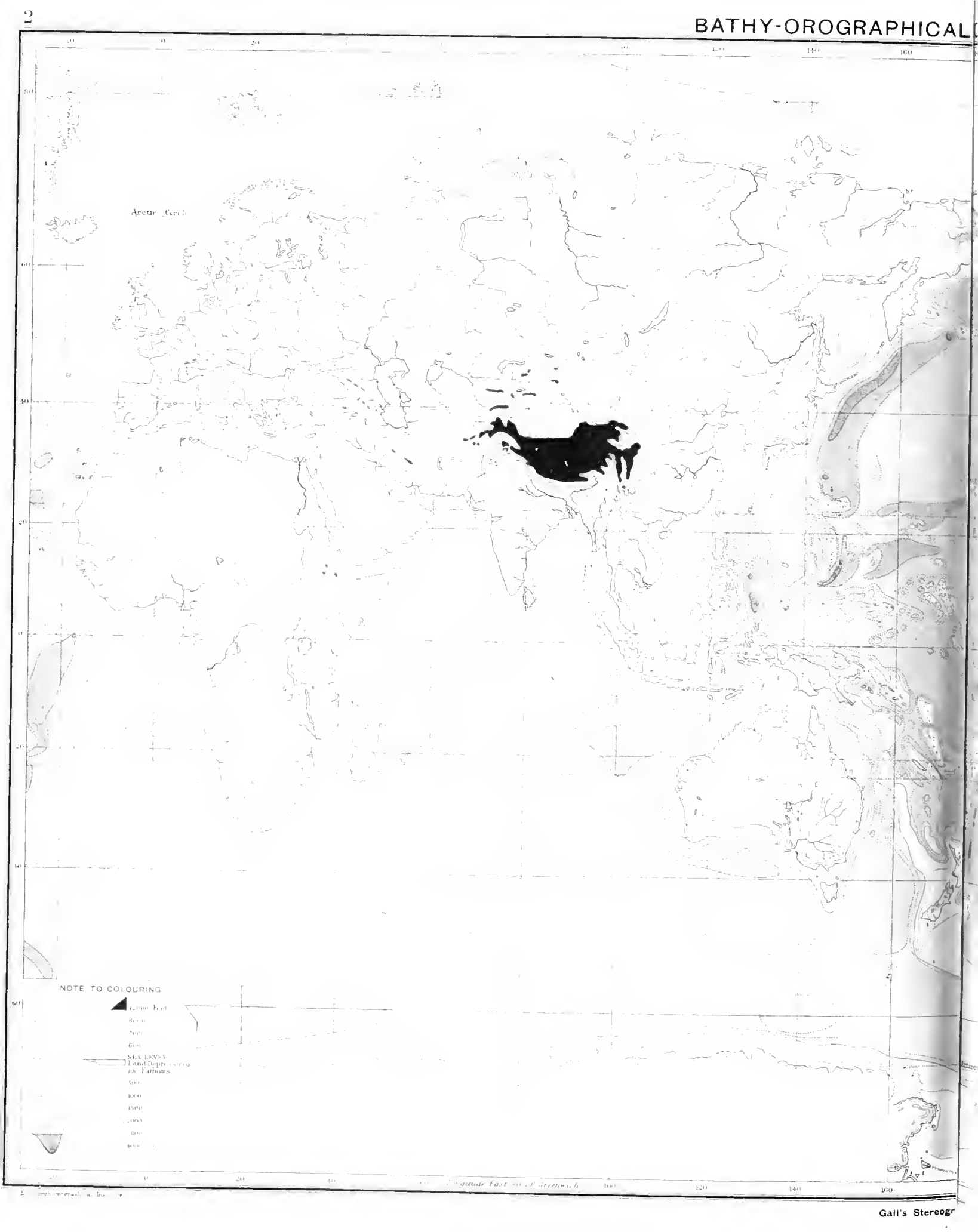
The figures represent Millions of Pounds Sterling

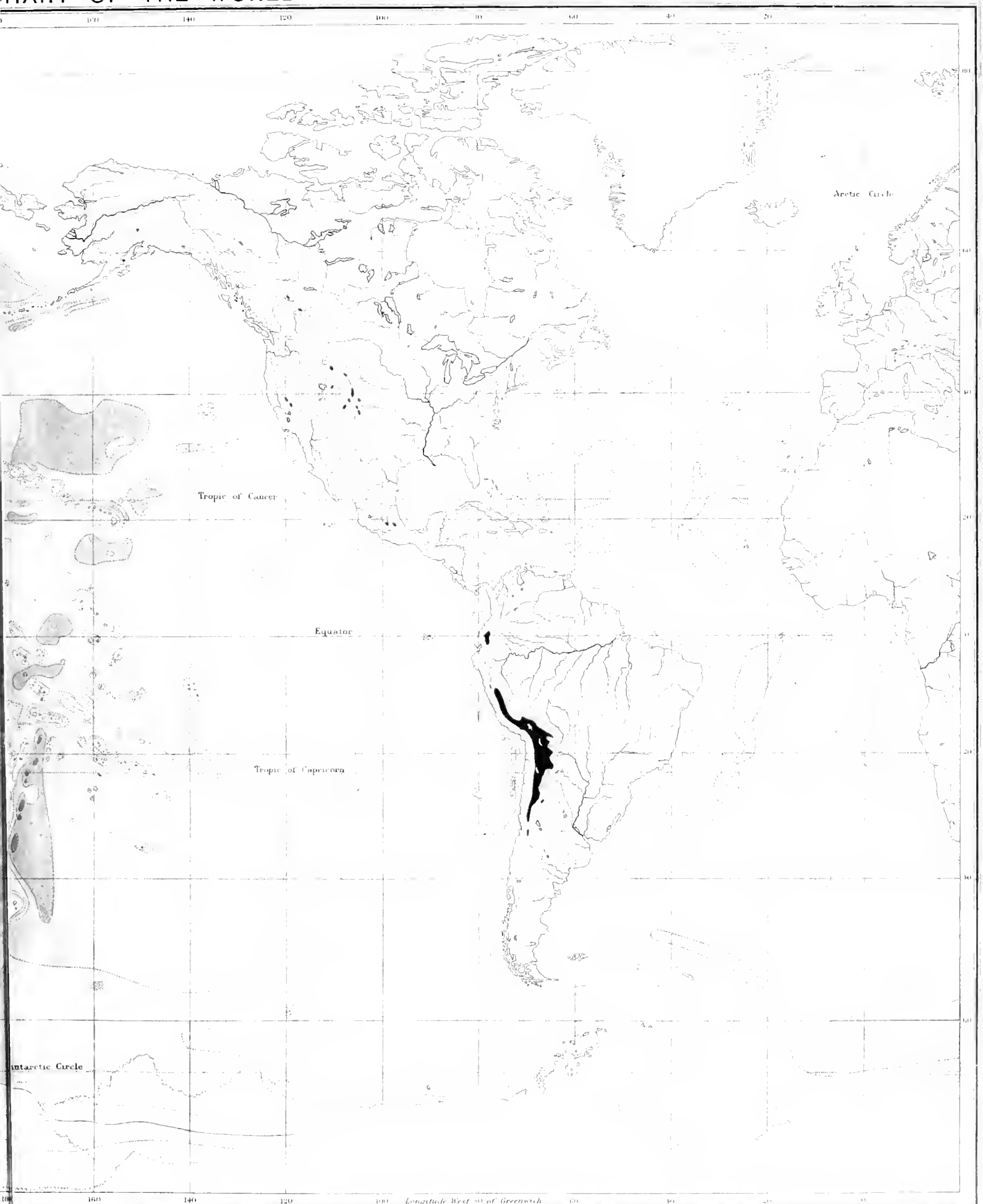
GROWTH OF TRADE OF FRANCE



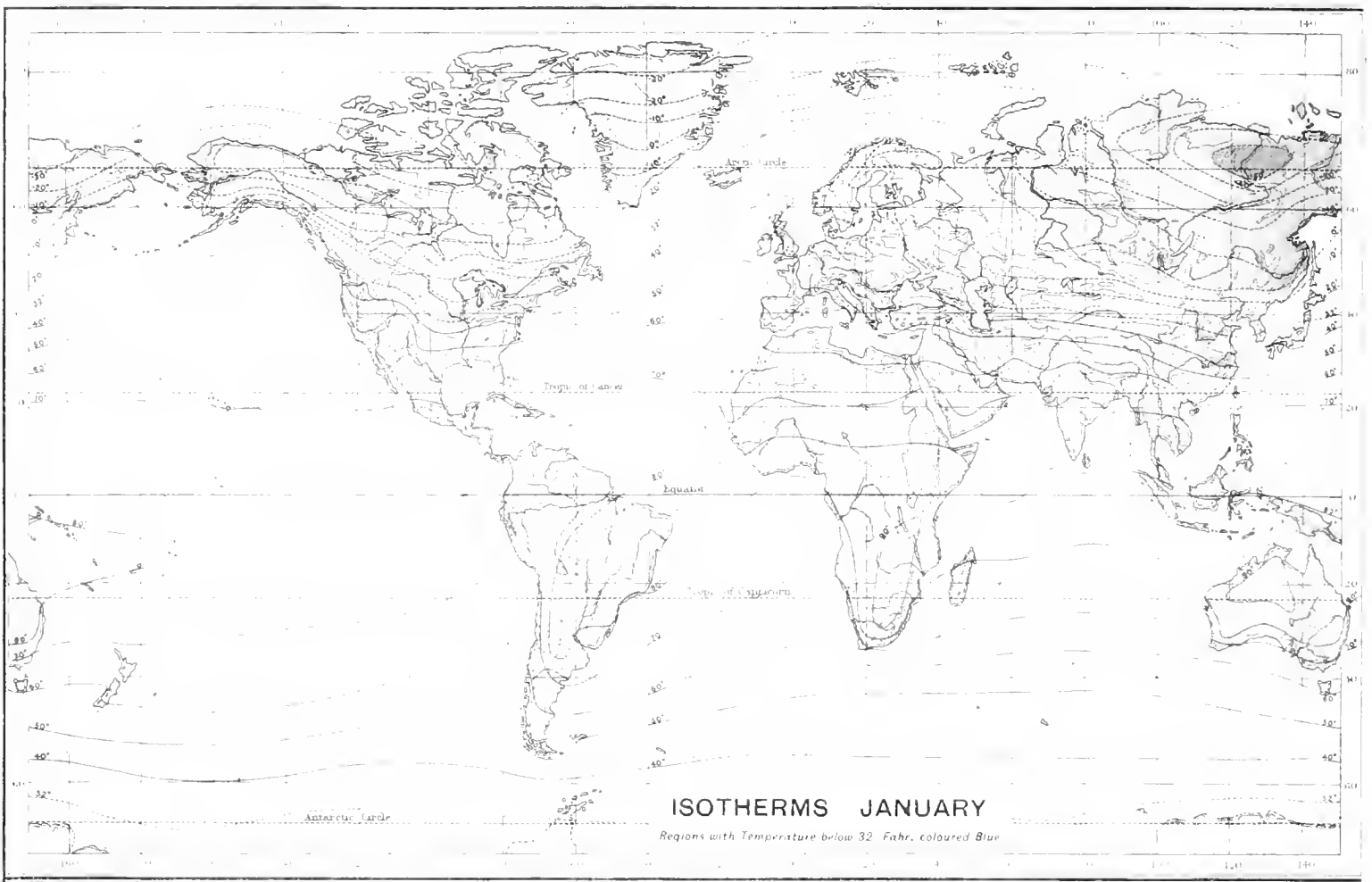
The figures represent Millions of Pounds Sterling

BATHY-OROGRAPHICAL



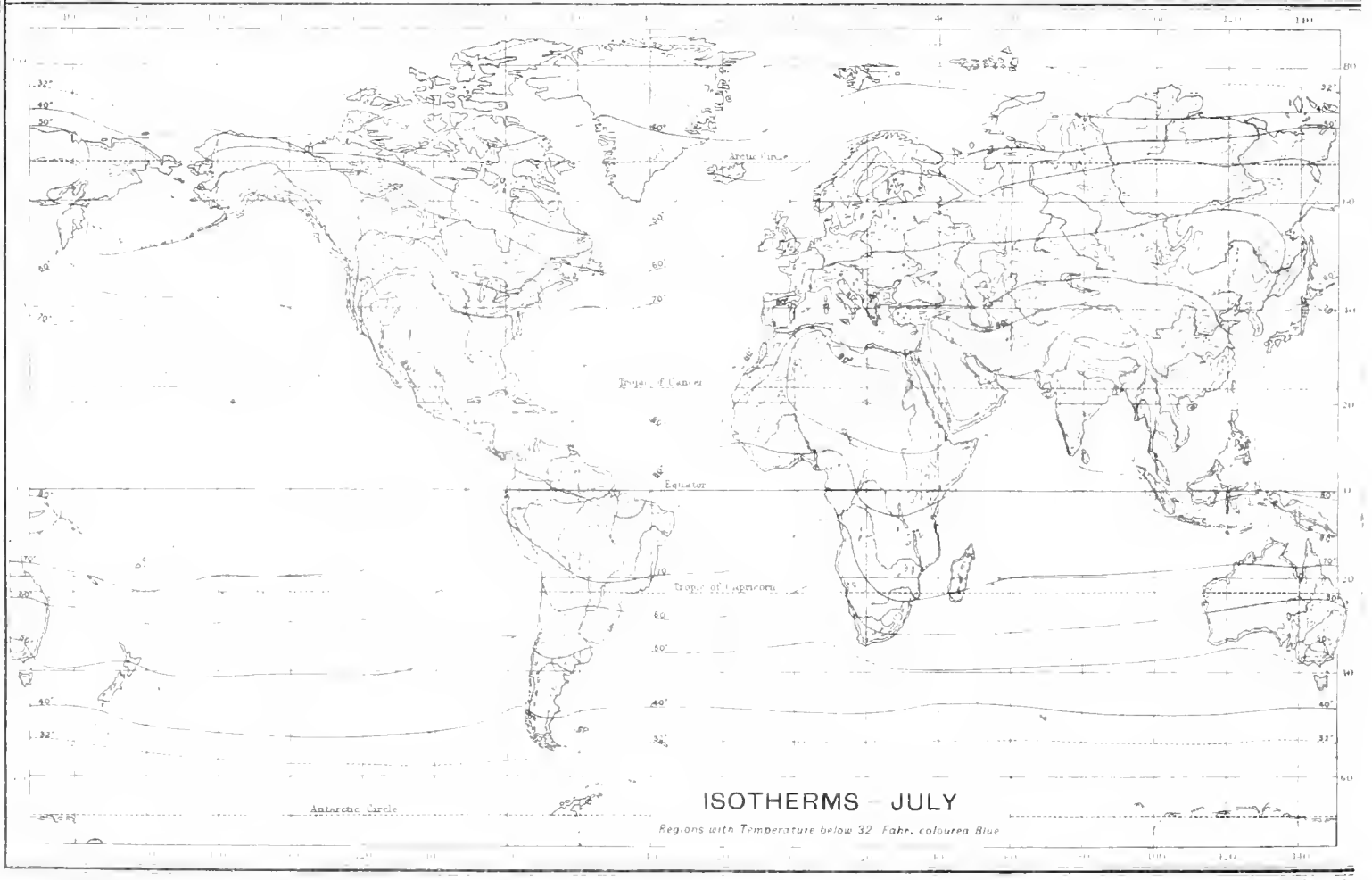

Arctic Circle
Tropic of Cancer
Equator
Tropic of Capricorn
Antarctic Circle
Longitude West 50 of Greenwich
English Miles

Projection



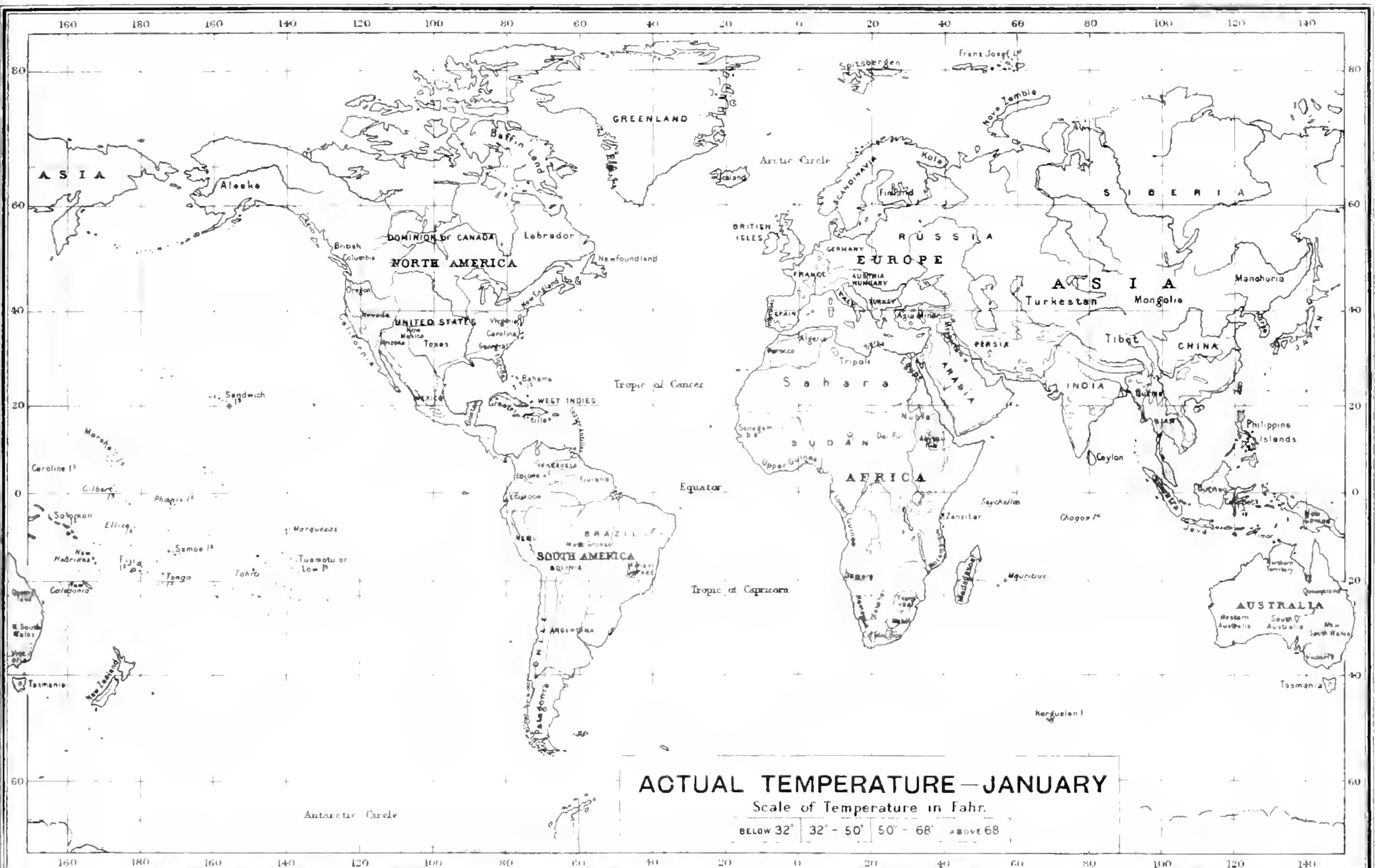
ISOTHERMS JANUARY

Regions with Temperature below 32 Fahr. coloured Blue



ISOTHERMS JULY

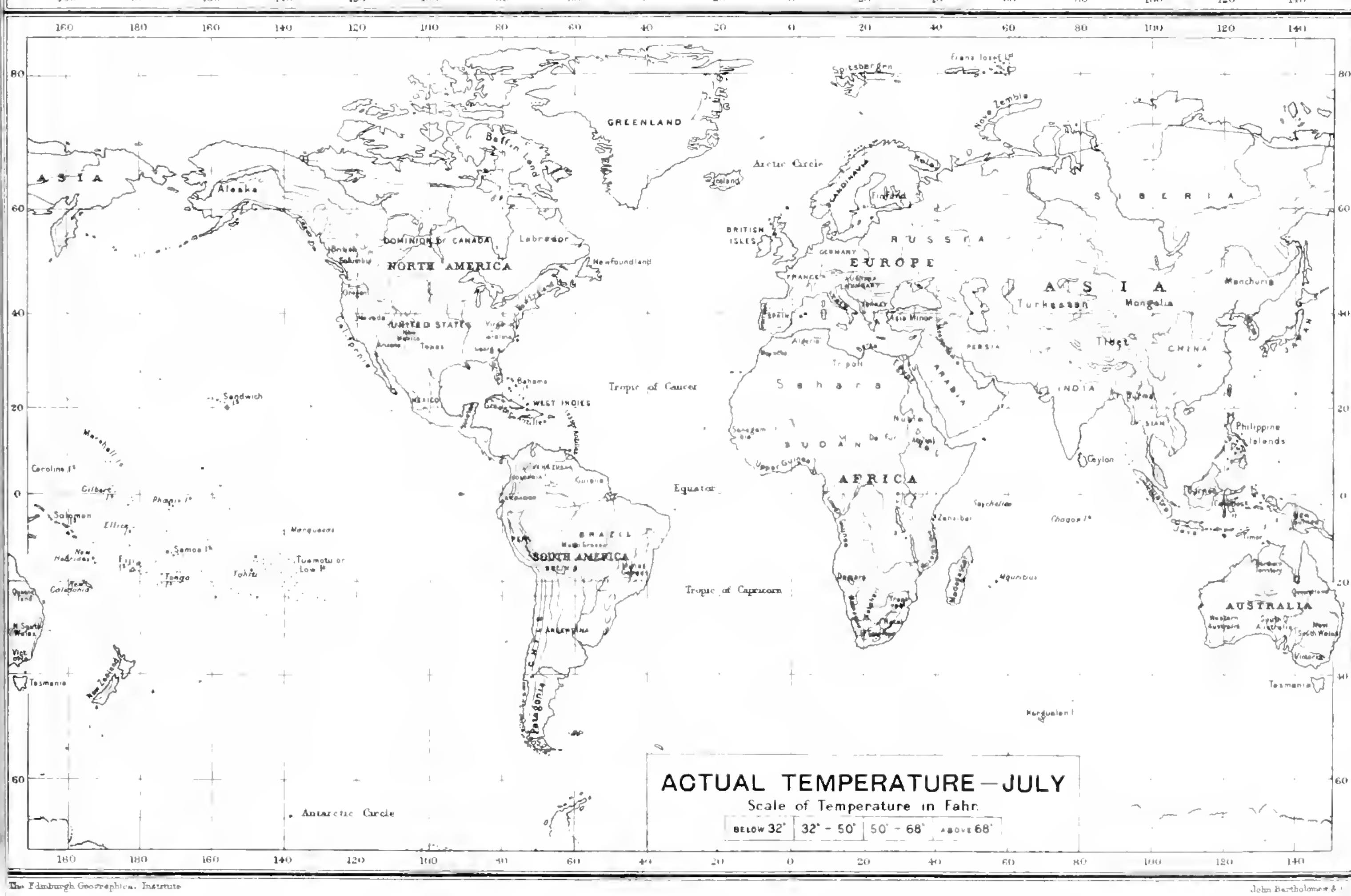
Regions with Temperature below 32 Fahr. coloured Blue



ACTUAL TEMPERATURE—JANUARY

Scale of Temperature in Fahr.

BELOW 32°	32° - 50°	50° - 68°	ABOVE 68



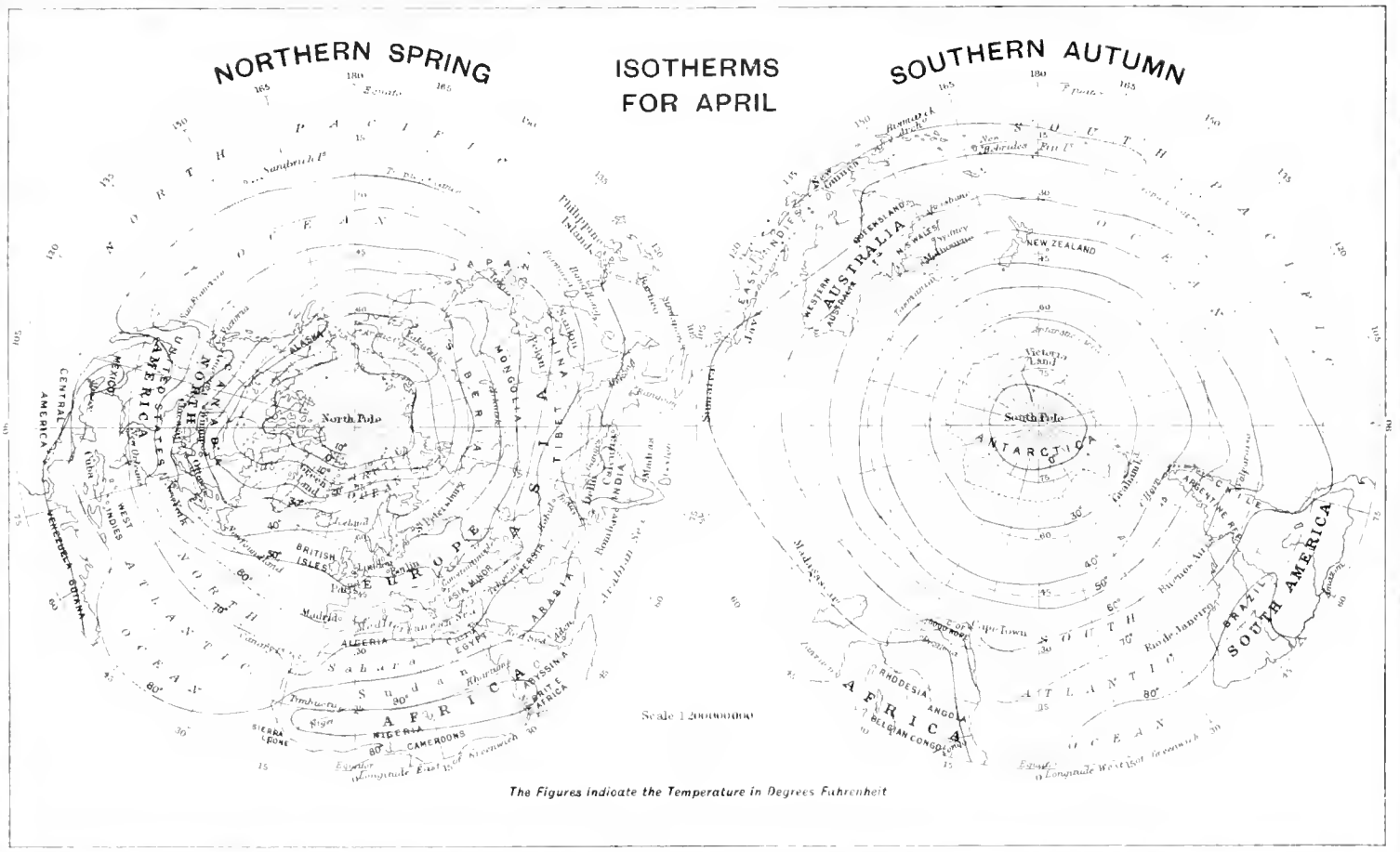
ACTUAL TEMPERATURE—JULY

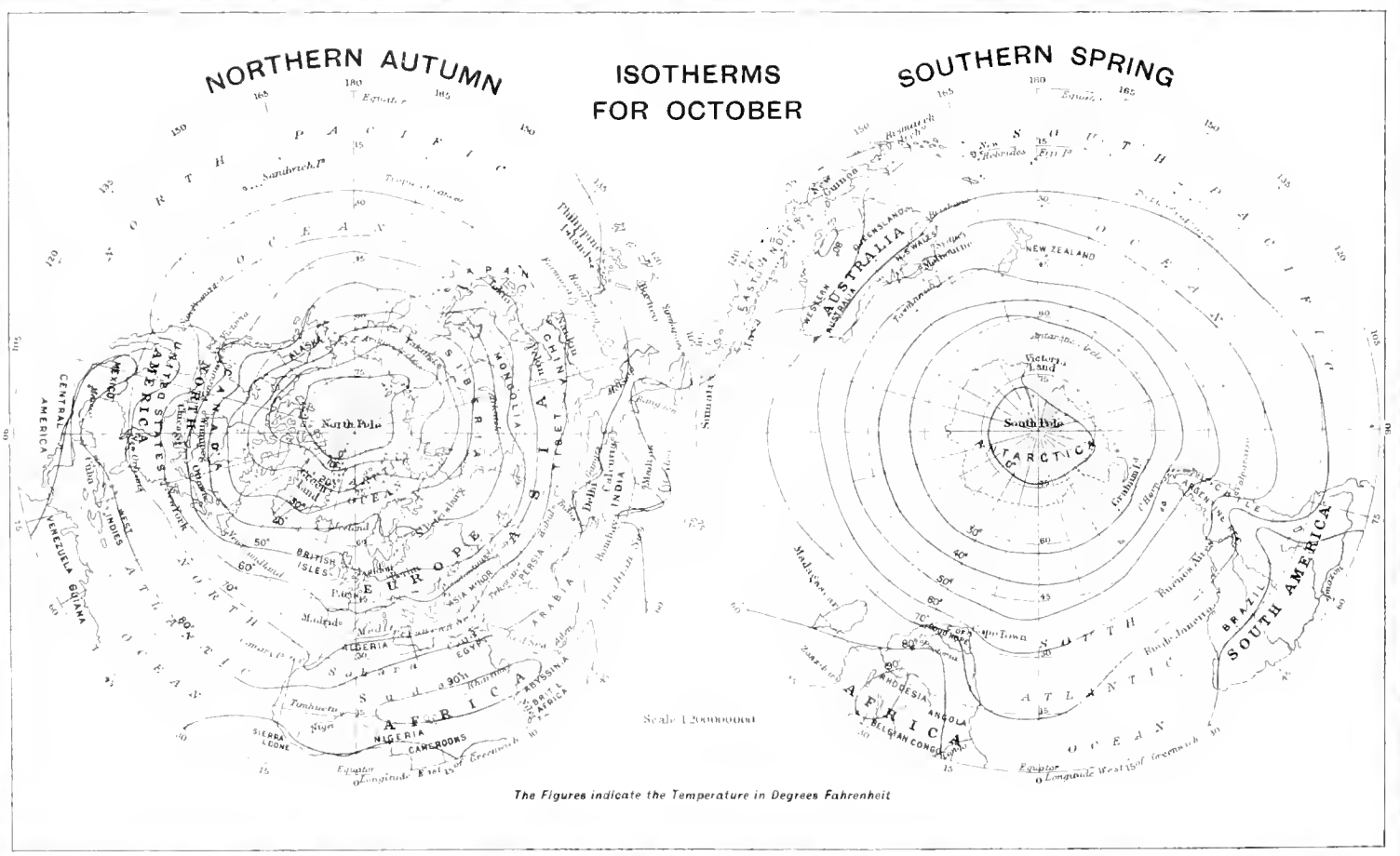
Scale of Temperature in Fahr.

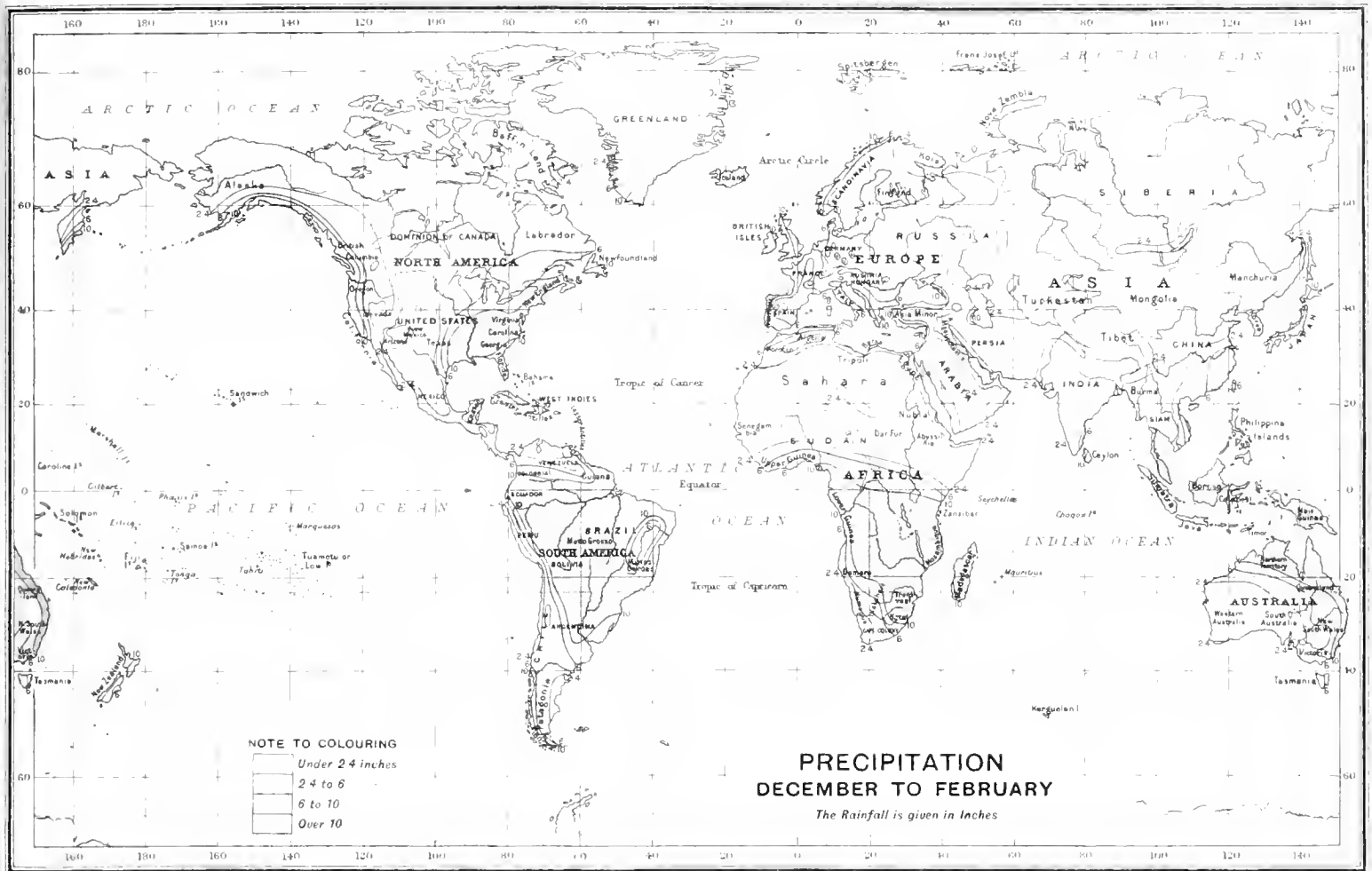
BELOW 32°	32° - 50°	50° - 68°	ABOVE 68°

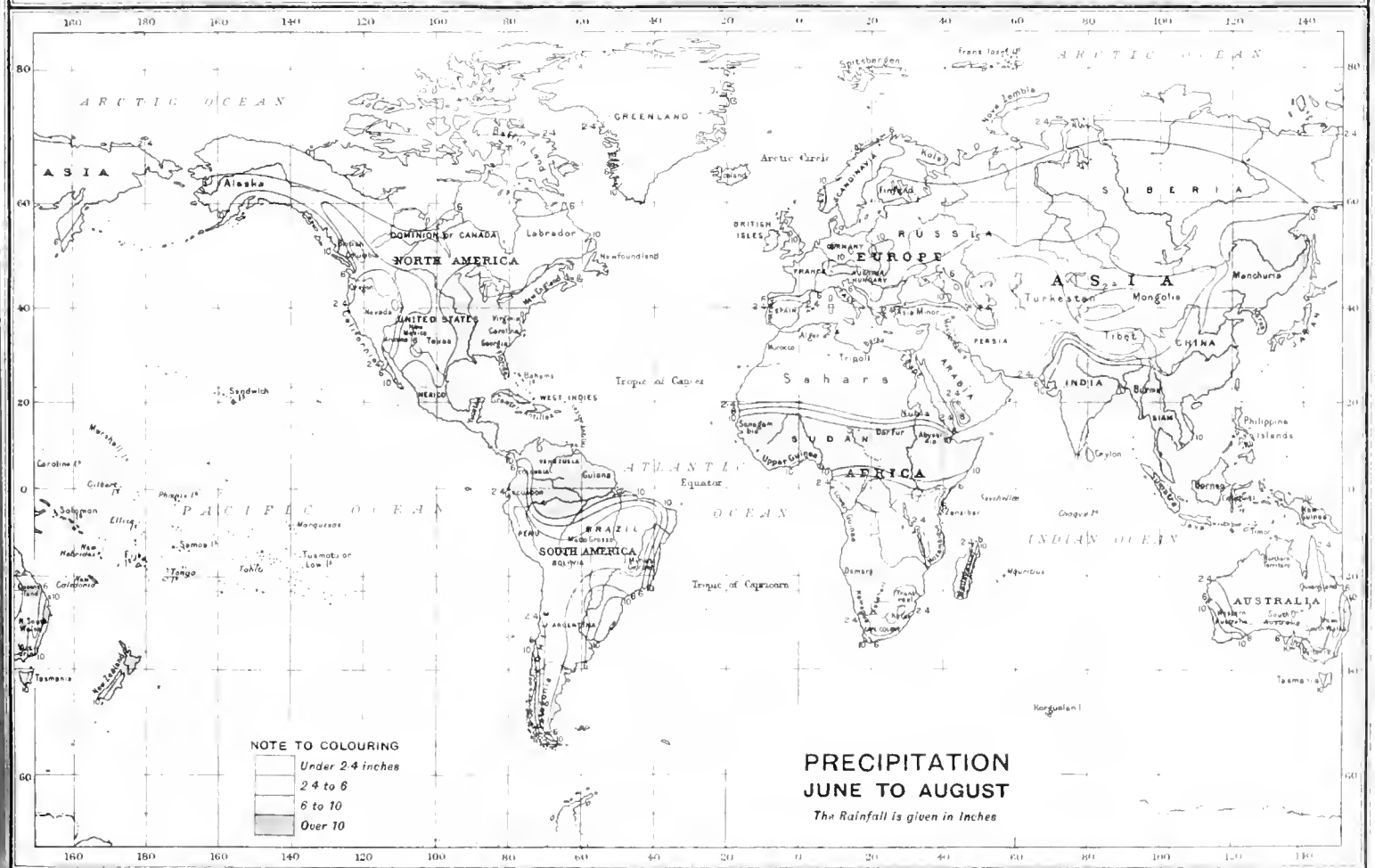
English Miles

CLIMATE
POLAR HEMISPHERES

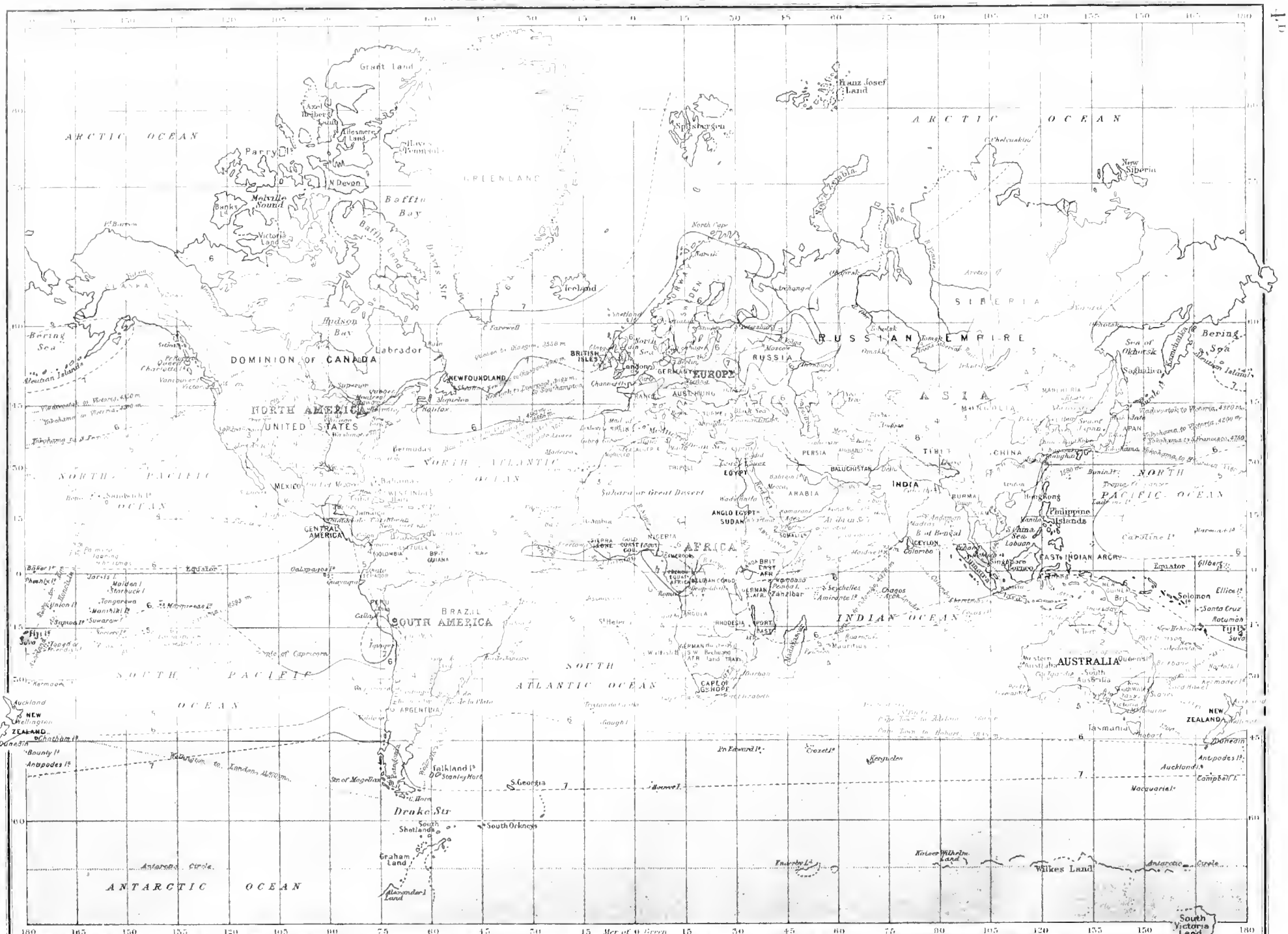








MEAN ANNUAL CLOUDINESS

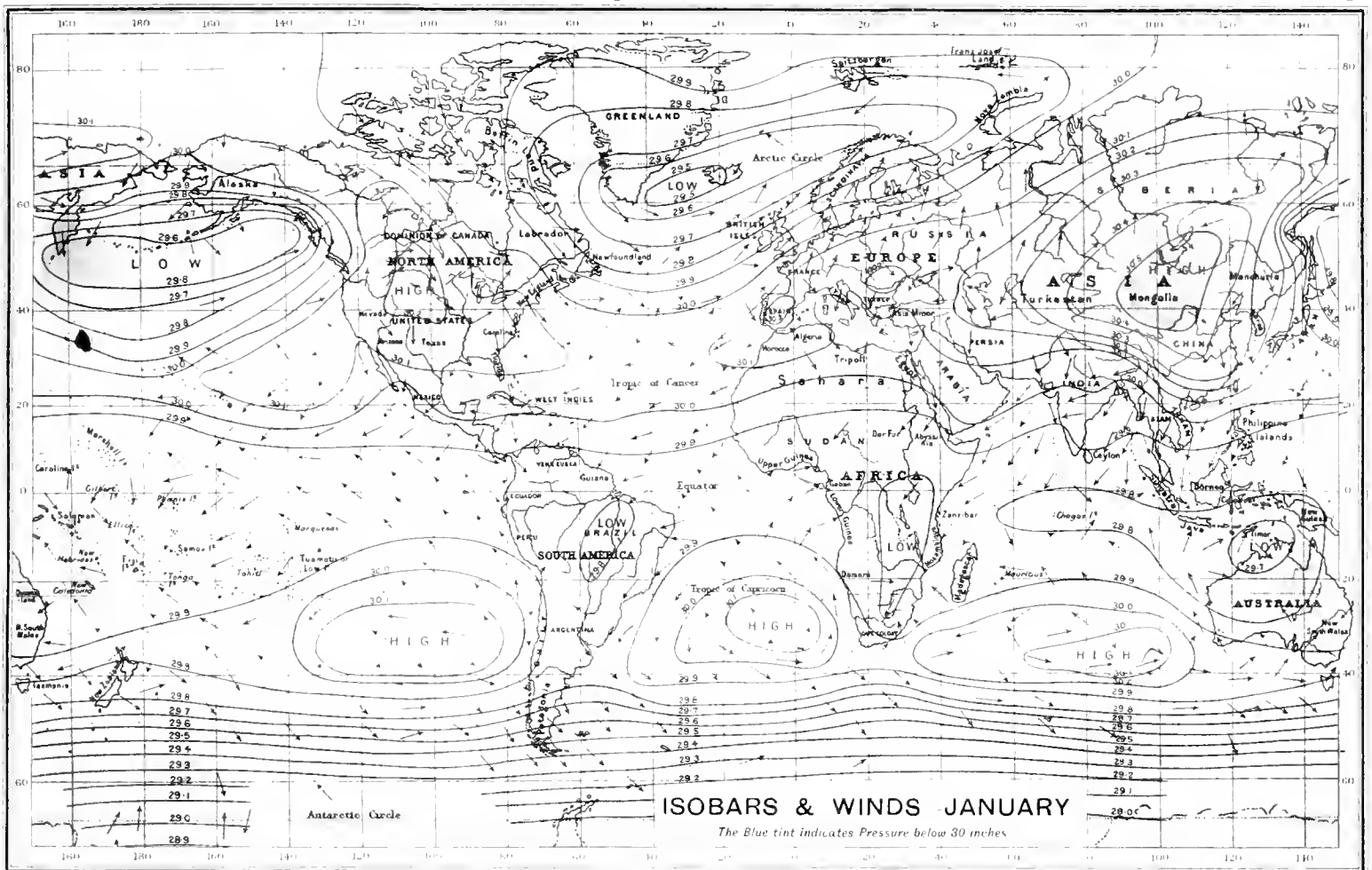


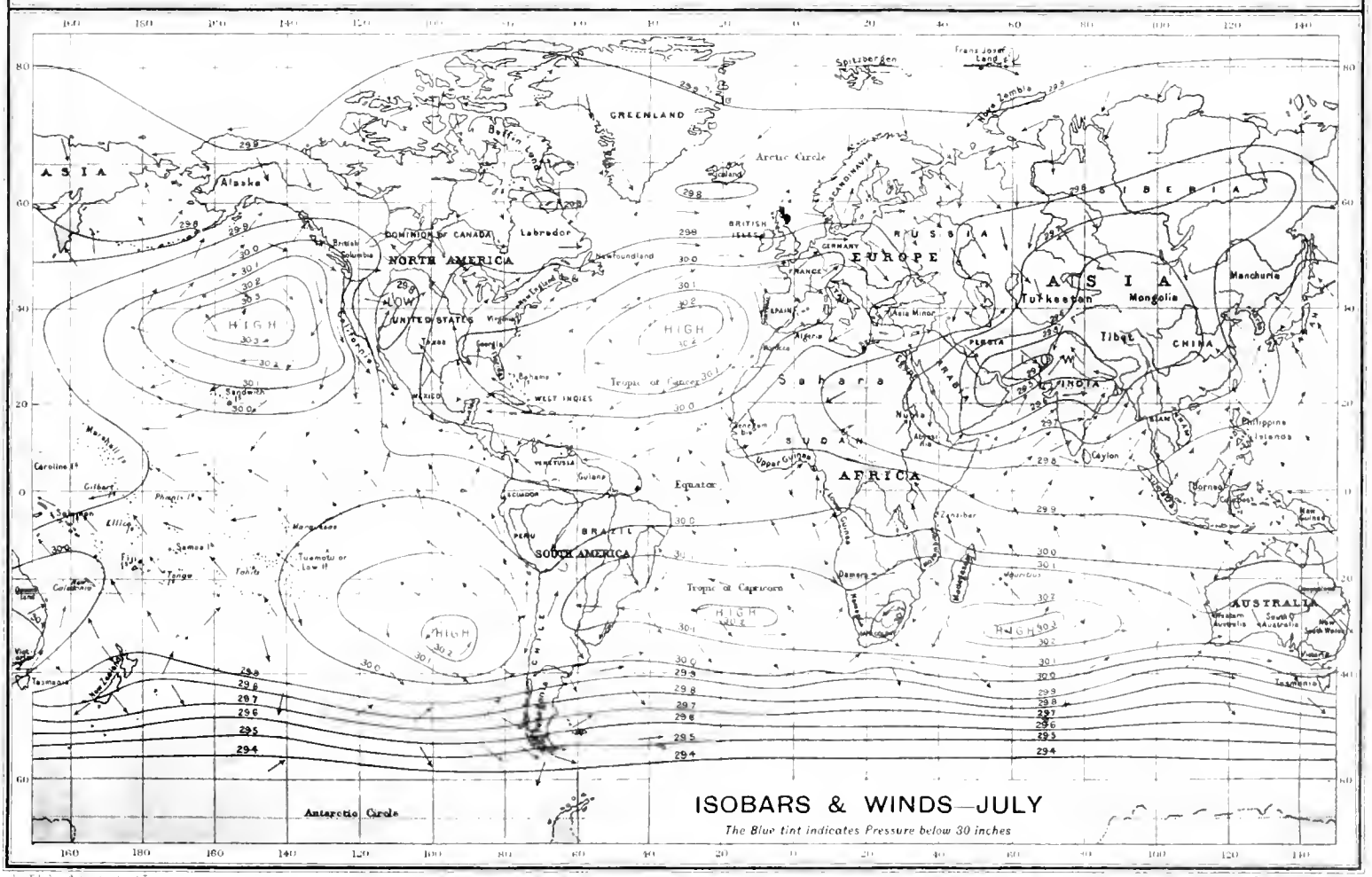
The Edinburgh Geographical Institute

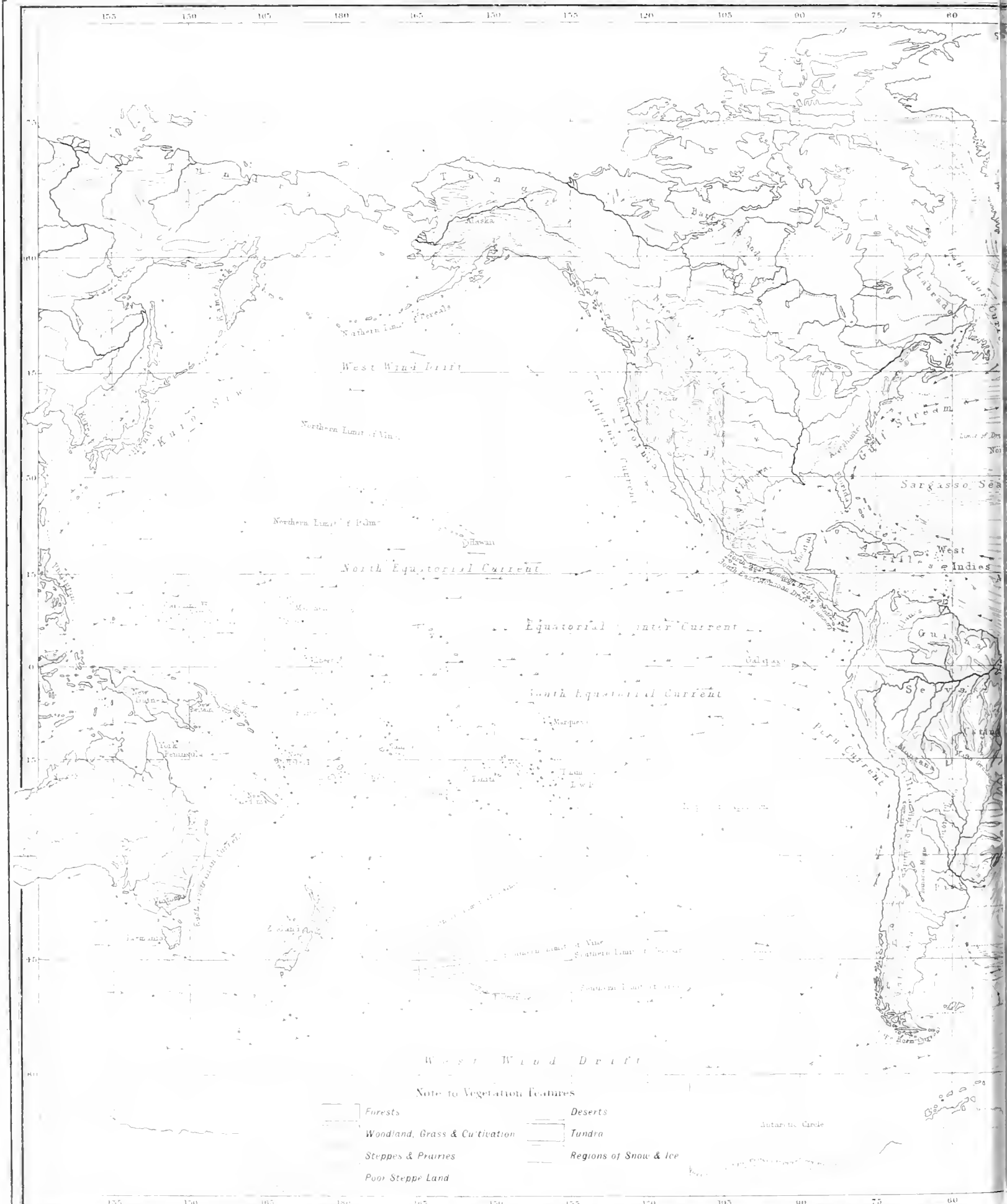
John Bartholomew & Co.

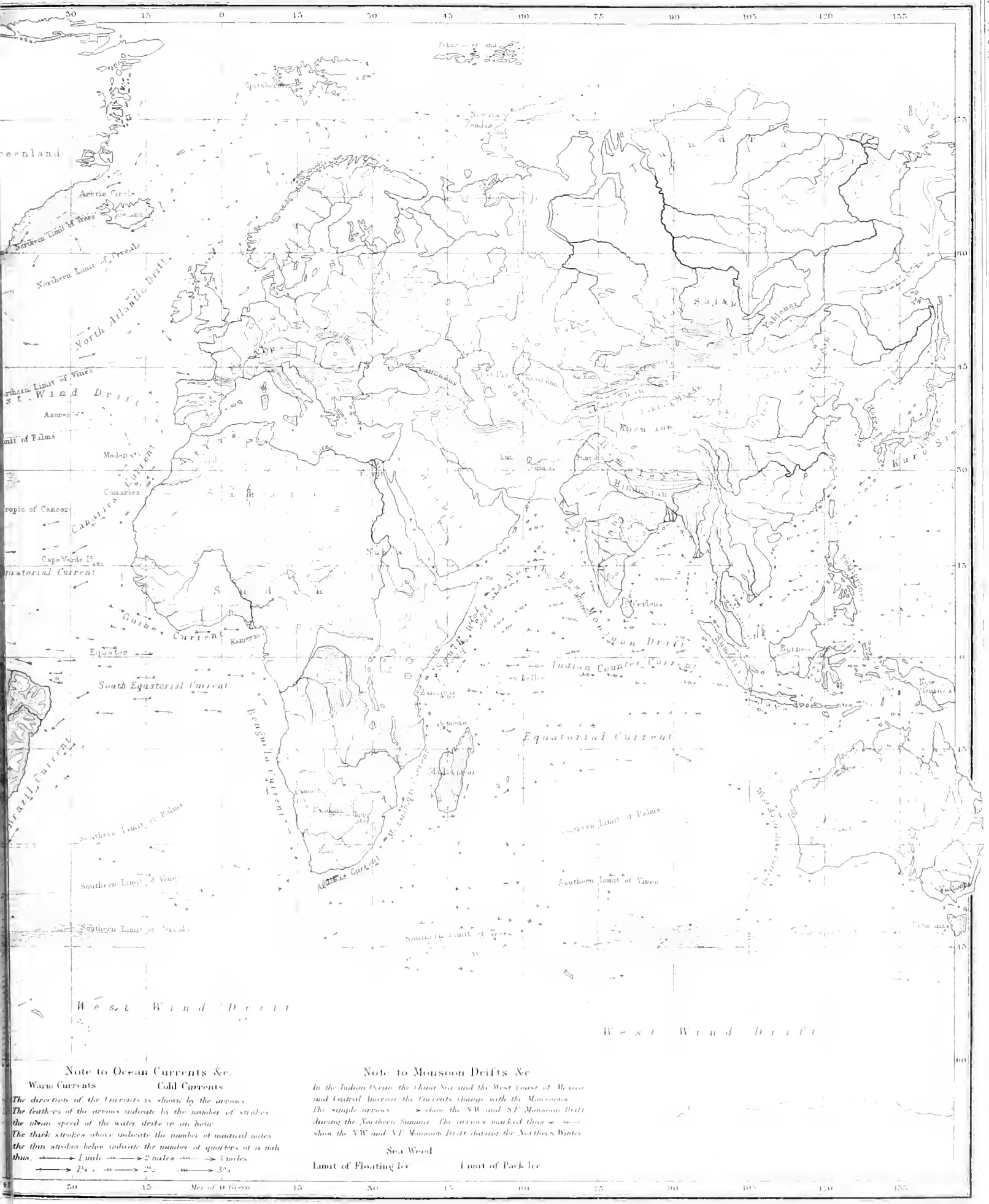
PROPORTION OF SKY COVERED WITH CLOUDS

UNDER 2	2 TO 3	3 TO 4	4 TO 5	5 TO 6	6 TO 7	OVER 7






West Wind Drift
North Equatorial Current
Equatorial Counter Current
South Equatorial Current
West Wind Drift
Sargasso Sea
Gulf Stream
Labrador Current
California Current
Peru Current
Kuro Siwo
Northern Limit of Vine
Northern Limit of Palms
Alaska
Bering Sea
Hudson Bay
Labrador
Newfoundland
Bermuda
Hawaii
Galapagos
Marquesas
Tahiti
New Guinea
Borneo
Celebes
Java
Sumatra
Philippines
Formosa
Japan
Aleutian Islands
Cape Horn
Antarctic Circle
Note to Vegetation Features
Forests
Woodland, Grass & Cultivation
Steppes & Prairies
Poor Steppe Land
Deserts
Tundra
Regions of Snow & Ice



Note to Ocean Currents &c.

Warm Currents Cold Currents

The direction of the Currents is shown by the arrows
The feathers of the arrows indicate by the number of strokes the mean speed of the water drift in an hour
The thick strokes above indicate the number of nautical miles the thin strokes below indicate the number of quarters of a mile thus, → *1 mile* → *2 miles* → *3 miles*
→ *2¼ miles* → *2½* → *3¾*

Note to Monsoon Drifts &c

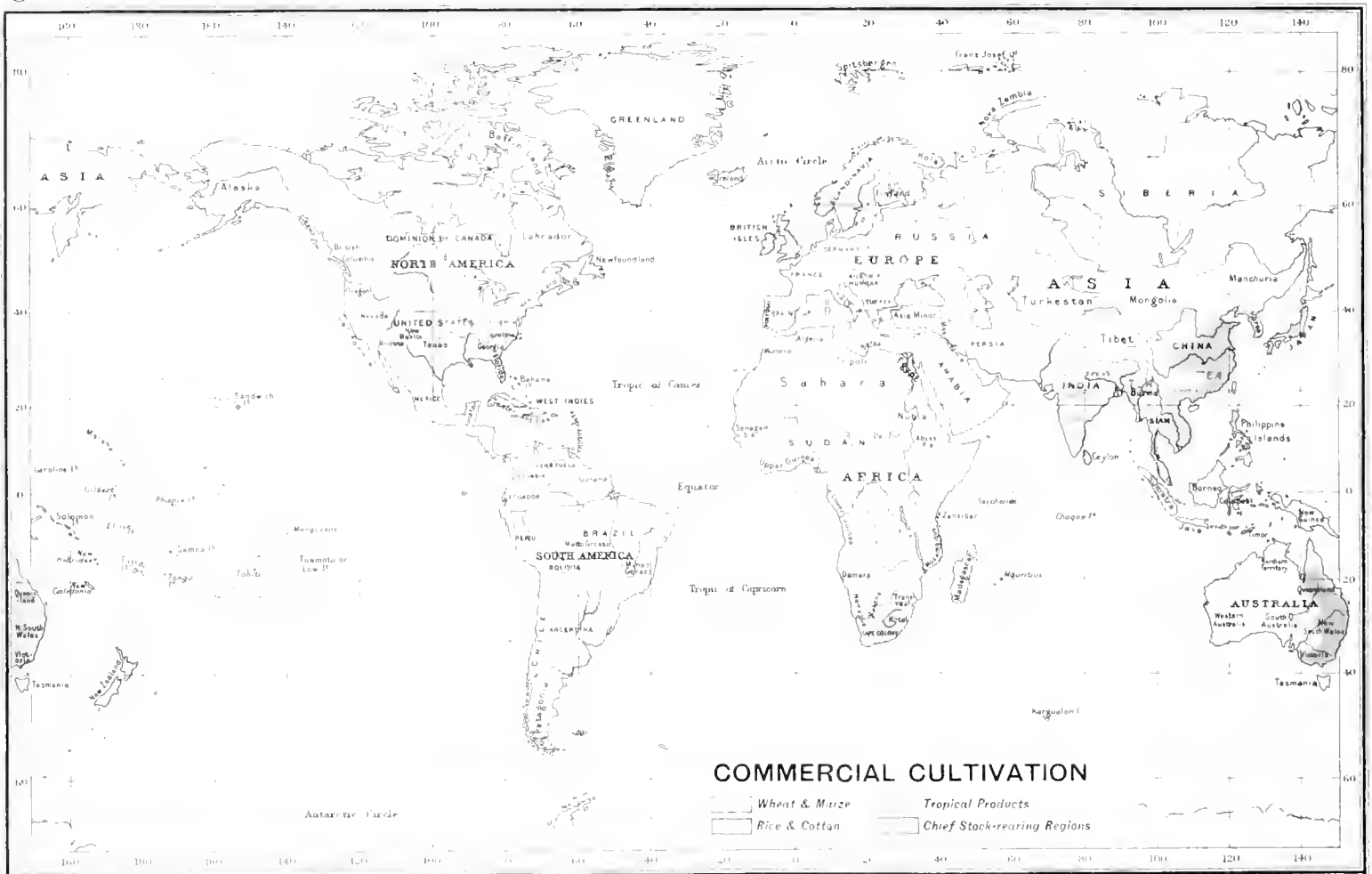
In the Indian Ocean the Chinese Sea and the West Coast of Mexico and Central America the Currents change with the Monsoons
The simple arrows ► *show the SW and SE Monsoon Drift during the Southern Summer. The arrows marked thus* ►► *show the NW and NE Monsoon Drift during the Northern Winter*

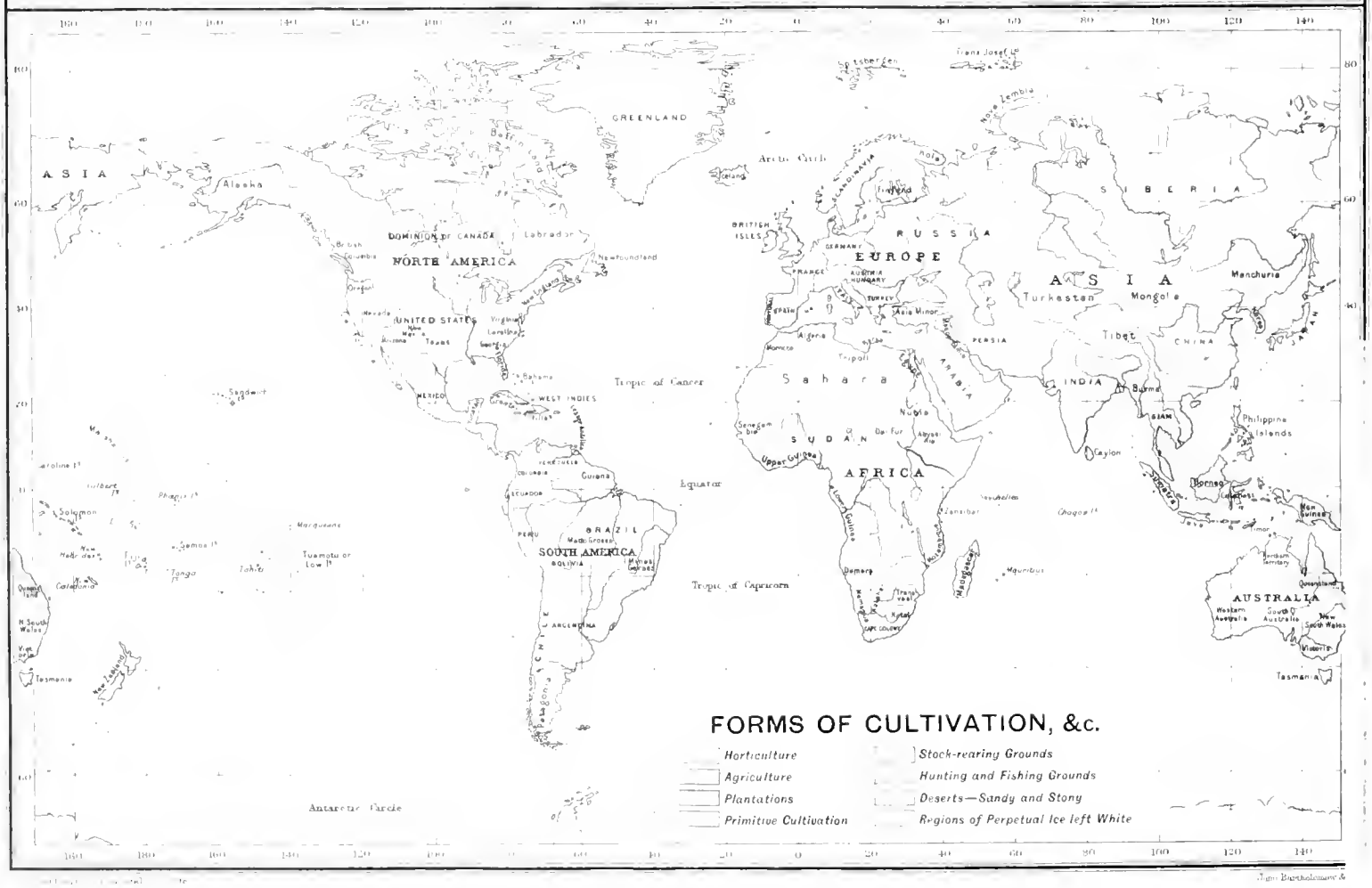
Sea Weed

Limit of Floating Ice Limit of Pack Ice

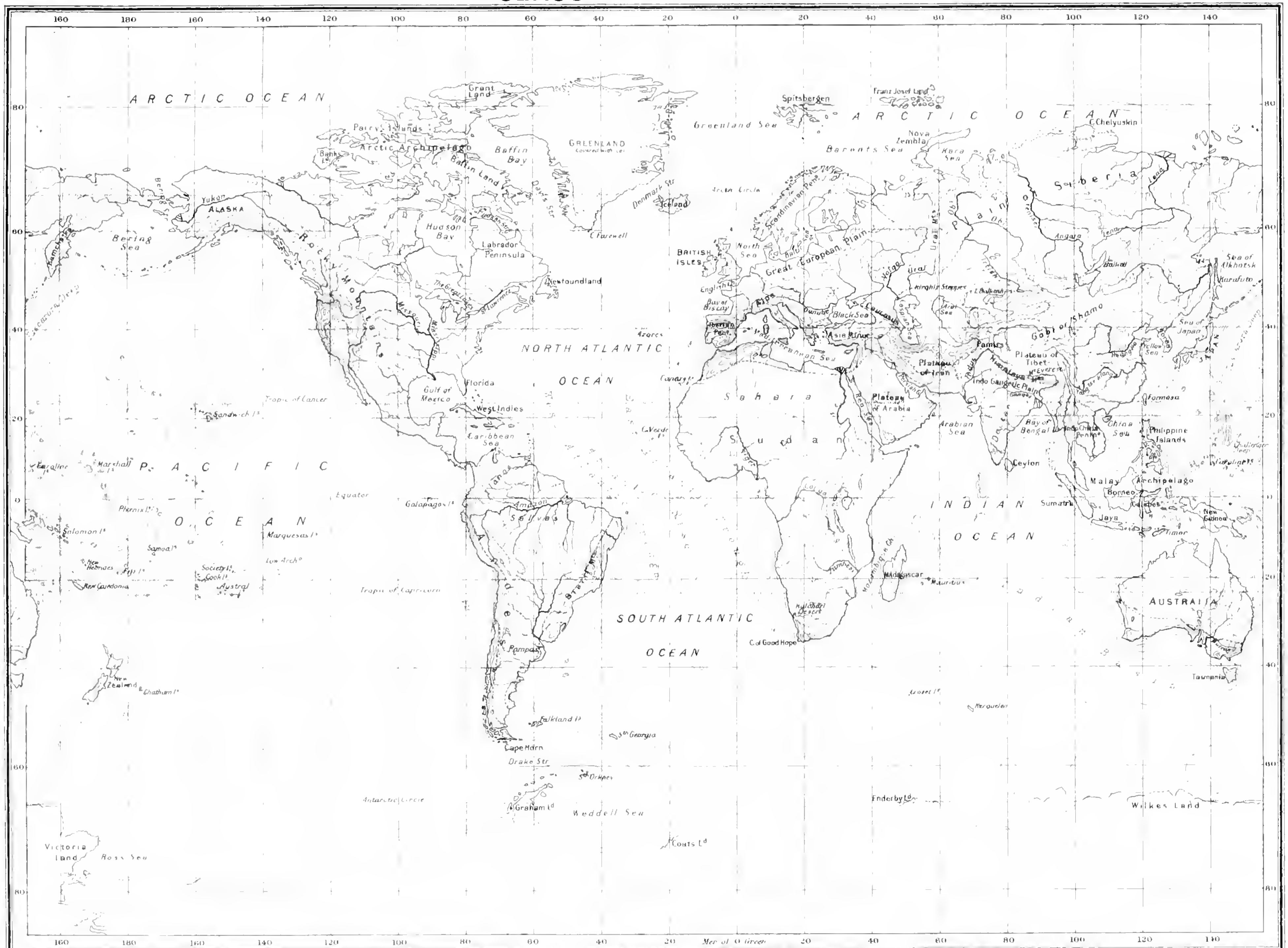
English Miles

CULTIVATION





SEASONAL RAINFALL



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RAIN AT ALL SEASONS

- Maximum in Summer
- Maximum in Winter

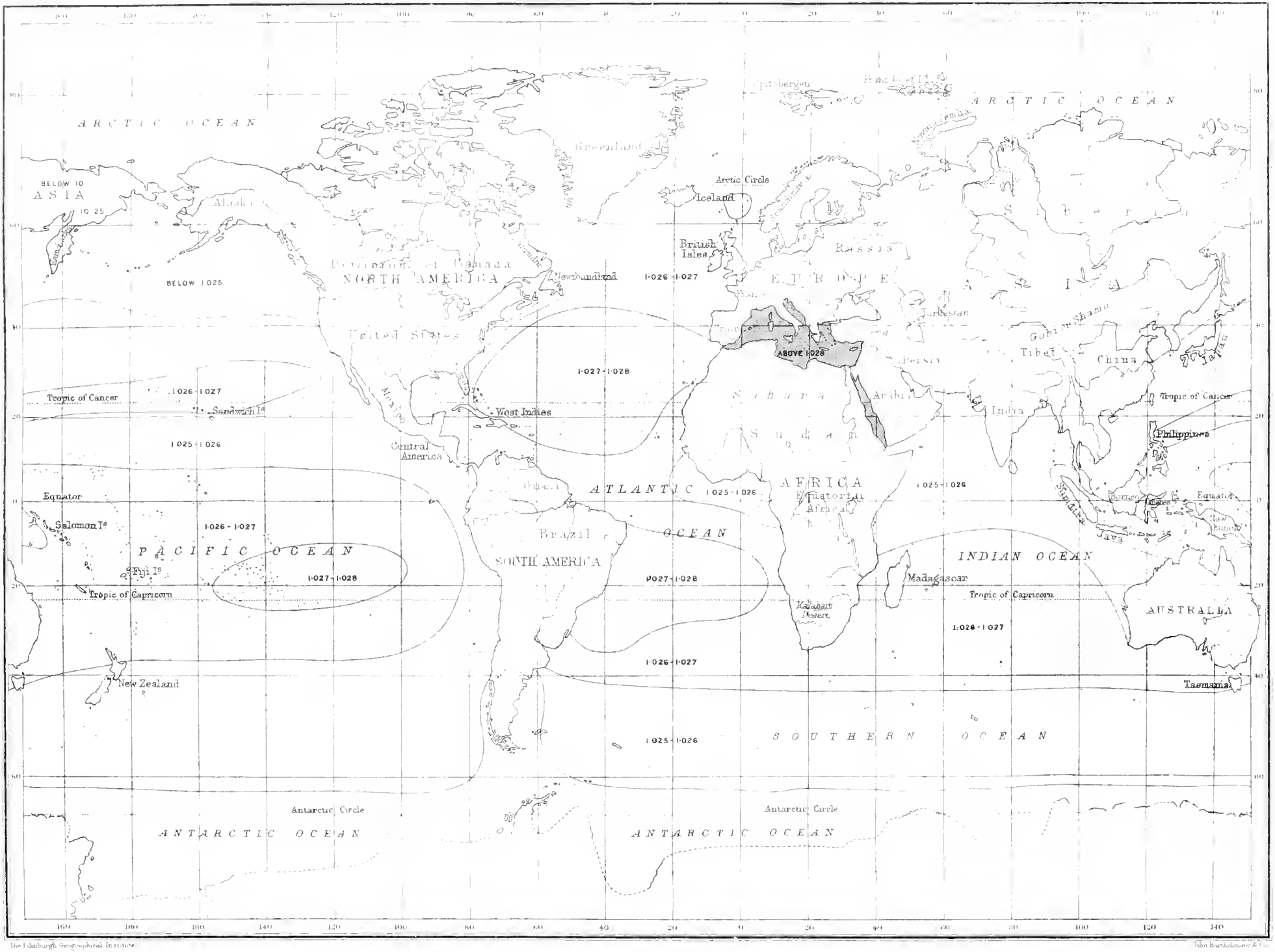
PERIODIC RAINS

- Double Maximum
- Rainy Season, Summer
- Rainy Season, Winter
- Rainy Season, Spring

CONSTANT DROUGHT

English Miles

OCEAN SALINITY & DESERTS



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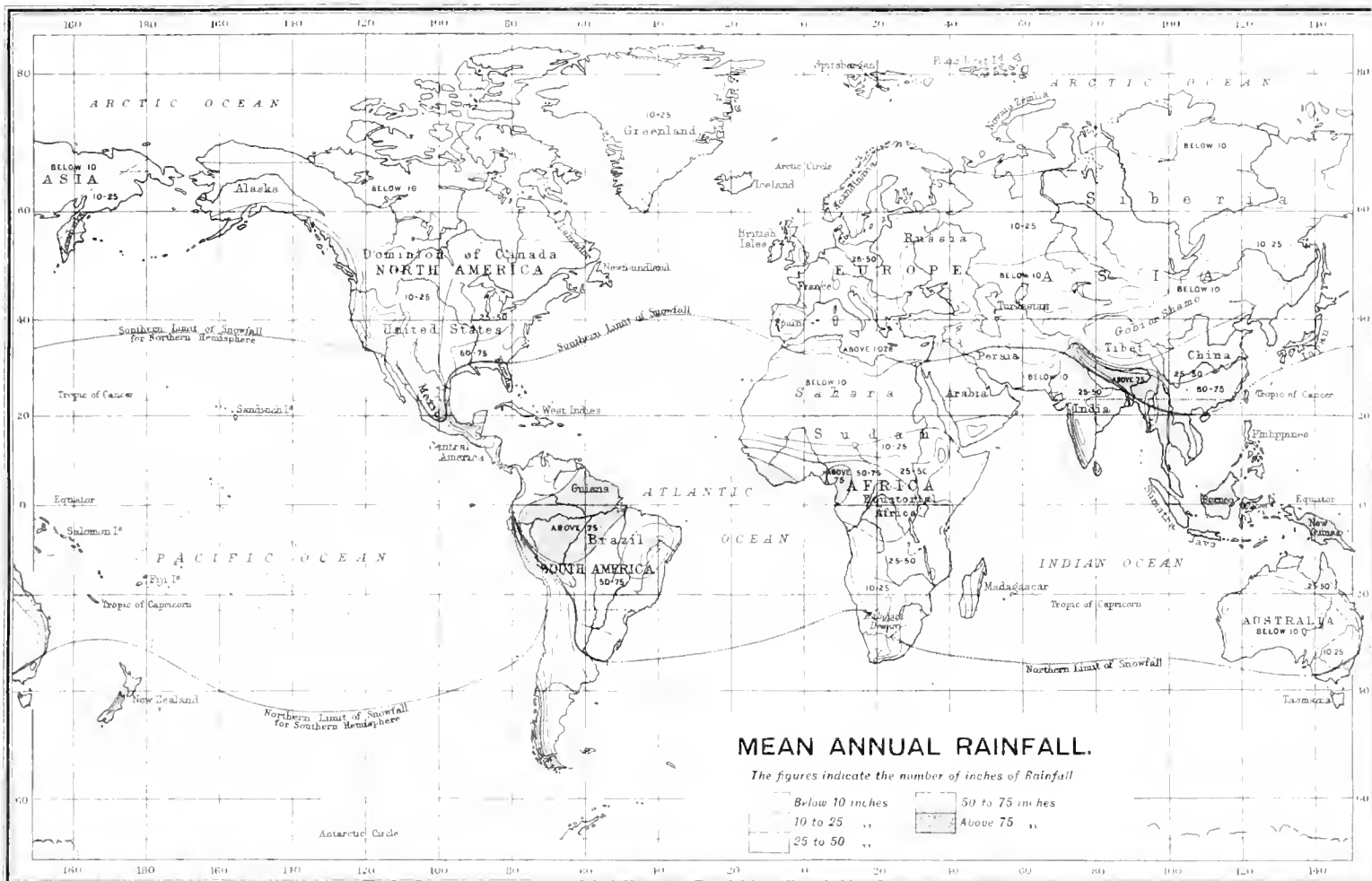
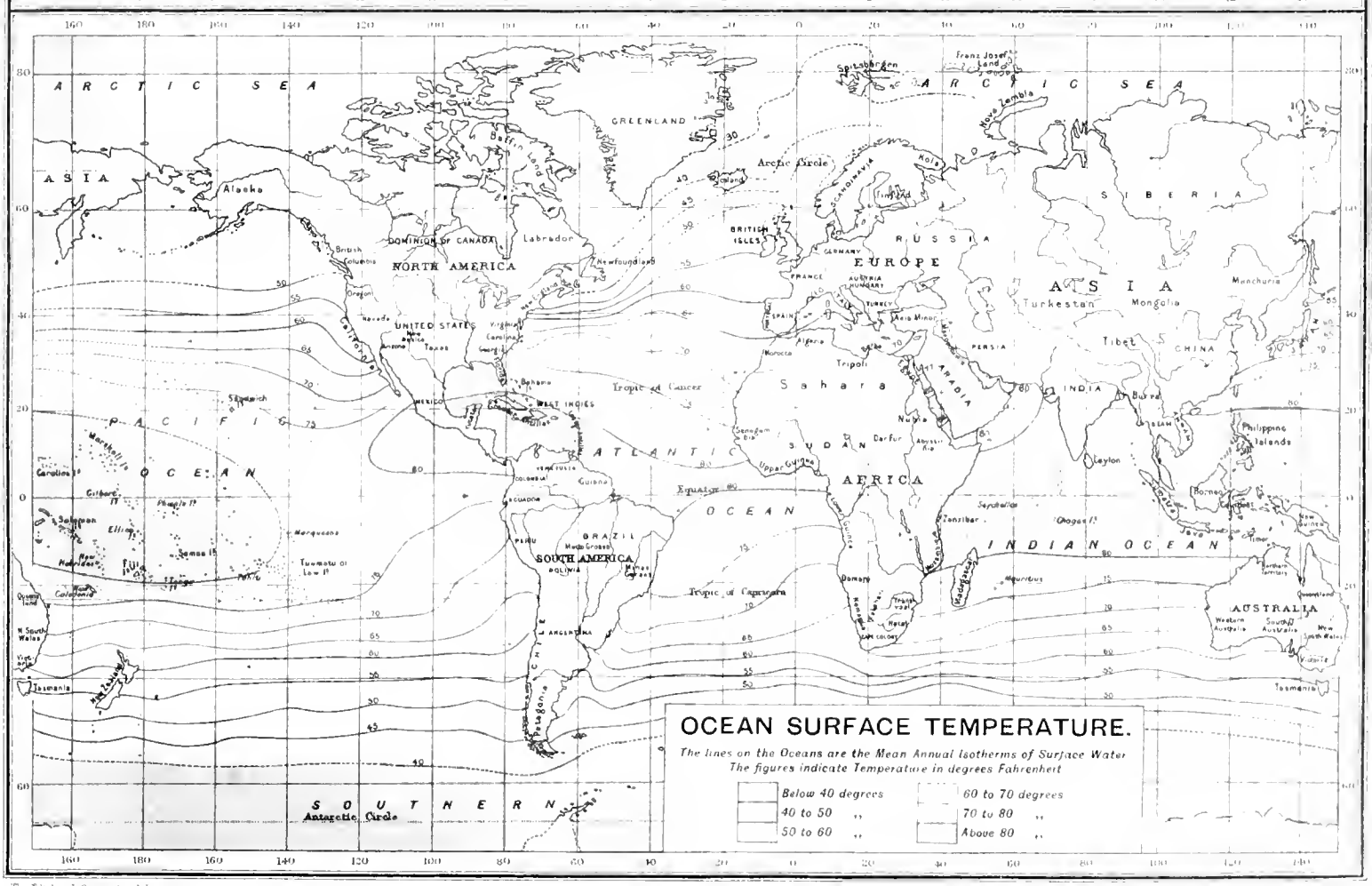
The Figures on the Sea indicate the comparative Salinity of the water

Deserts





English Miles

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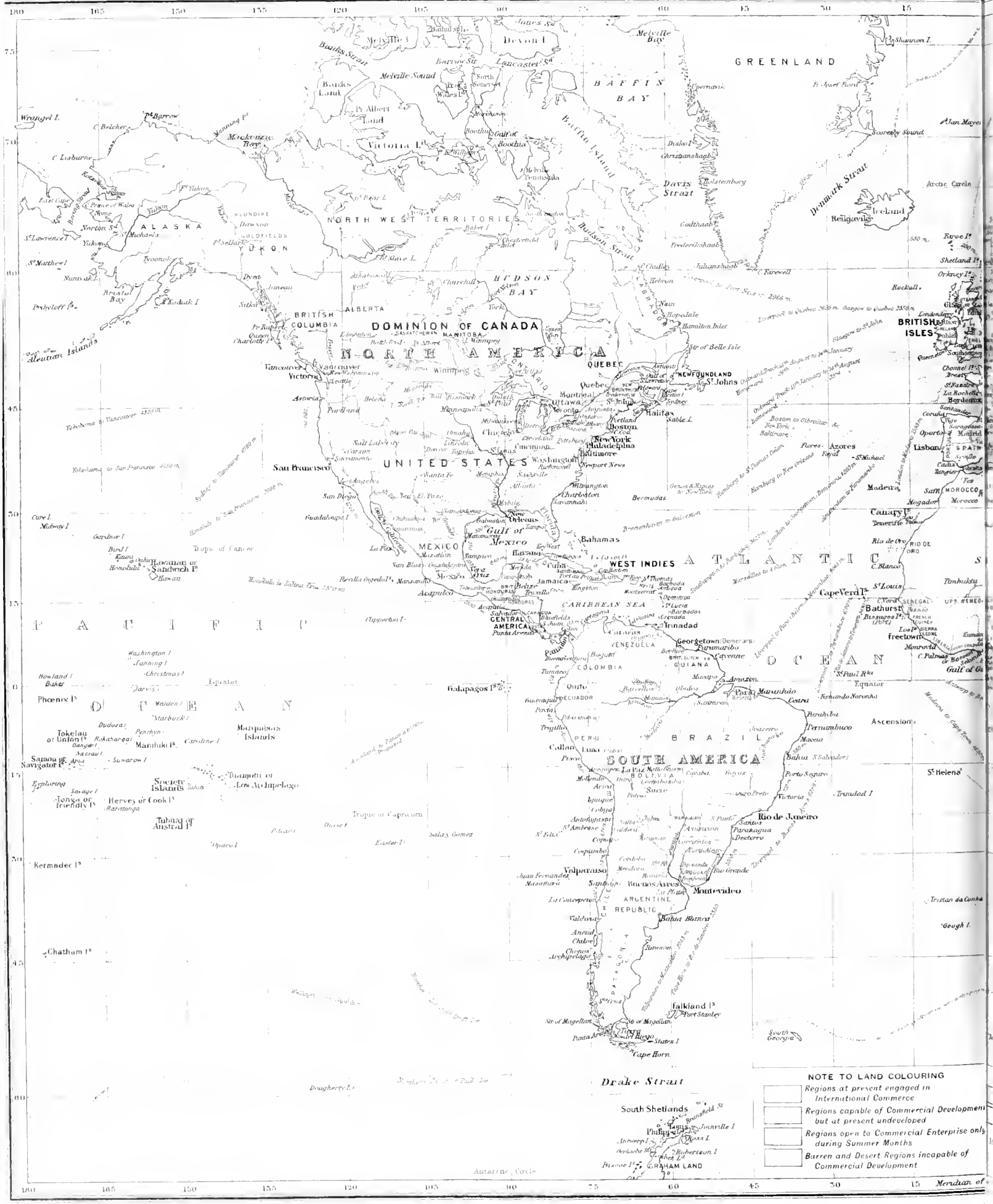
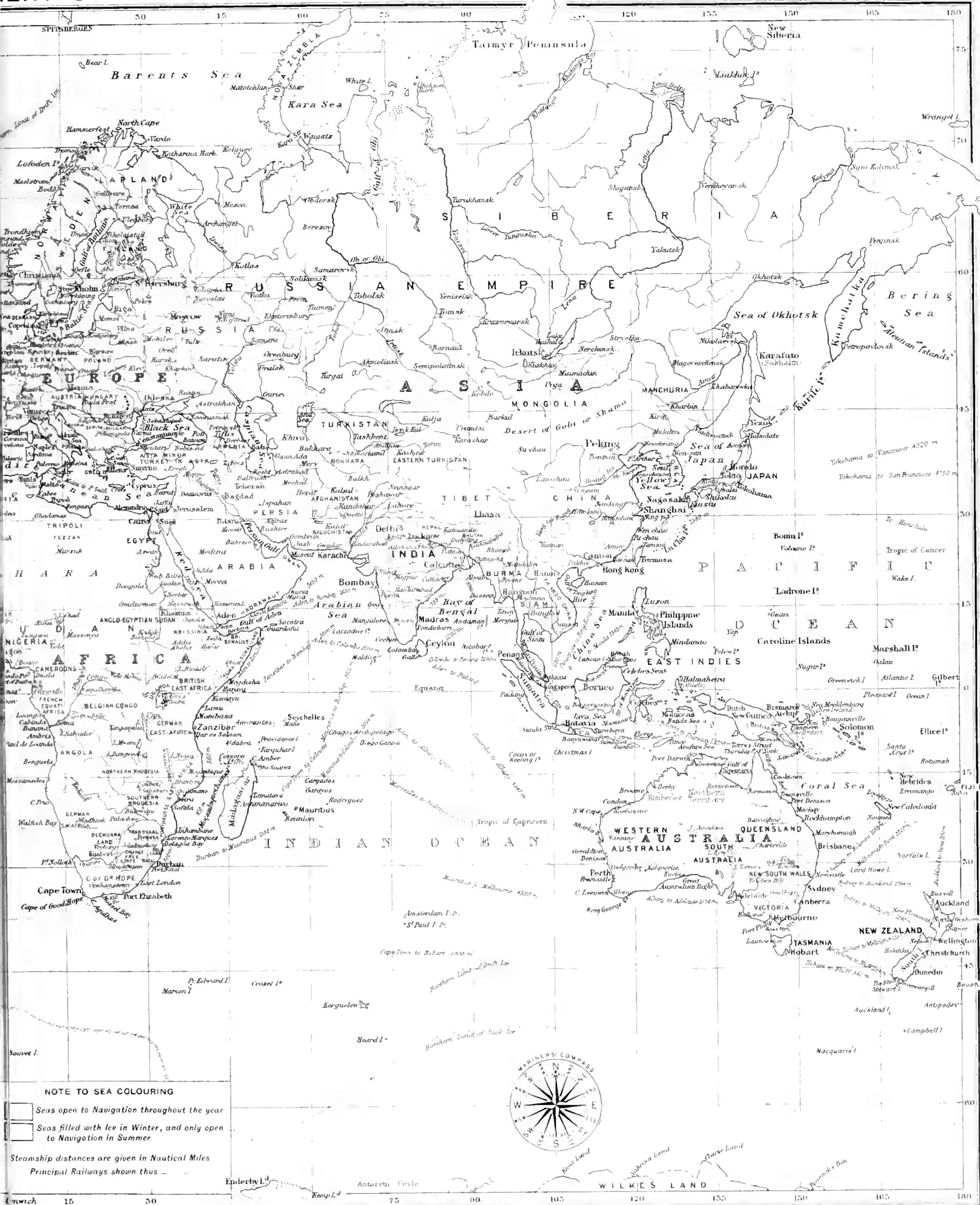
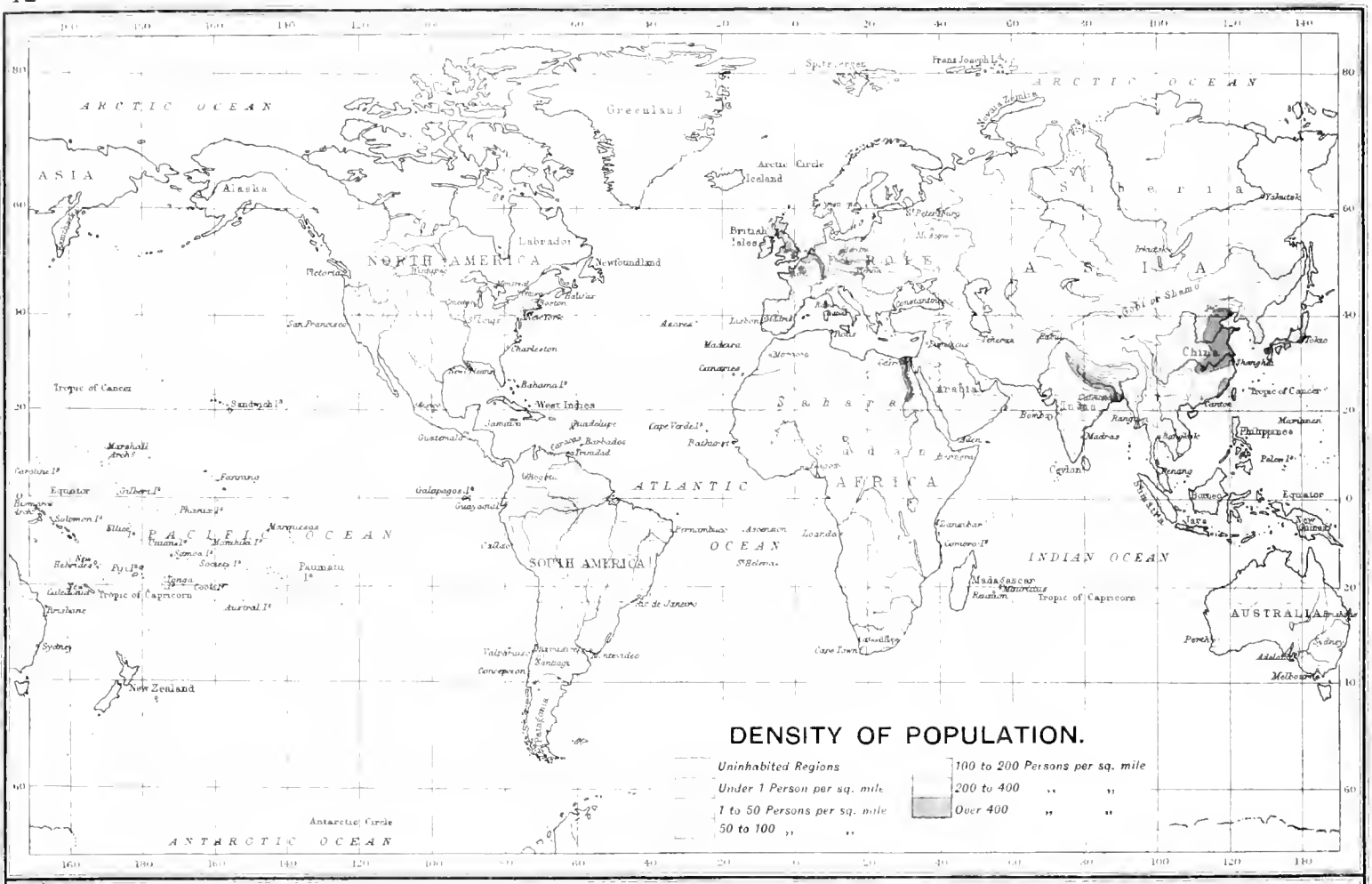
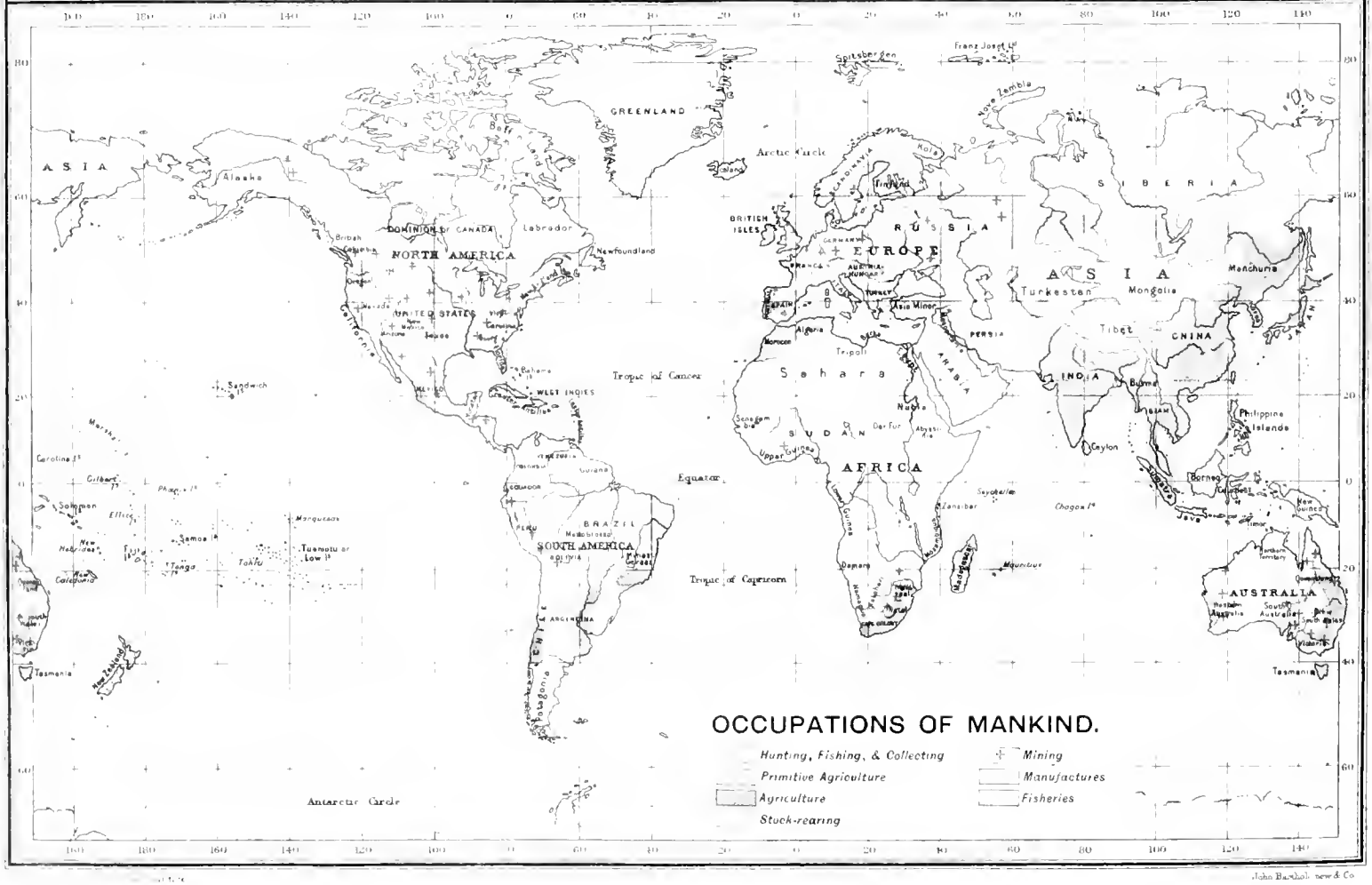

GREENLAND
BAFFIN BAY
Davis Strait
Baffin Island
Devon I
Melville I
Banks Land
Victoria L.
Wrangel I.
ALASKA
NORTH WEST TERRITORIES
YUKON
BRITISH COLUMBIA
ALBERTA
HUDSON BAY
DOMINION OF CANADA
NORTH AMERICA
QUEBEC
NEWFOUNDLAND
Ireland
BRITISH ISLES
Aleutian Islands
UNITED STATES
San Francisco
Vancouver
Victoria
Seattle
Portland
Chicago
New York
Philadelphia
Baltimore
Boston
Halifax
Montreal
Ottawa
Toronto
Quebec
St. John's
MEXICO
Gulf of Mexico
Havana
Bahamas
WEST INDIES
Cuba
Jamaica
CARIBBEAN SEA
CENTRAL AMERICA
Trinidad
VENEZUELA
COLOMBIA
GUIANA
Georgetown
Paramaribo
Cayenne
Galapagos Is.
ECUADOR
PERU
BRAZIL
SOUTH AMERICA
Rio de Janeiro
Santos
Pernambuco
Bahia
Montevideo
Buenos Aires
ARGENTINE REPUBLIC
Valparaiso
Falkland Is.
Port Stanley
Cape Horn
Drake Strait
South Shetlands
GRAHAM LAND
PACIFIC OCEAN
ATLANTIC OCEAN
Hawaiian or Sandwich Is.
Phoenix Is.
Tokelau or Union Is.
Manihiki Is.
Marquises Islands
Society Islands
Tonga or Friendly Is.
Hervey or Cook Is.
Tubuai or Austral Is.
Kermadec Is.
Chatham Is.
Easter I.
Juan Fernandez
Tristan da Cunha
Gough I.
St. Helena
Ascension
Cape Verd Is.
Canary Is.
Madeira
Azores
Bermudas
Trinidad I.
Equator
Tropic of Cancer
Tropic of Capricorn
Antarctic Circle
Meridian of
Mercator'
NOTE TO LAND COLOURING
Regions at present engaged in International Commerce
Regions capable of Commercial Development but at present undeveloped
Regions open to Commercial Enterprise only during Summer Months
Barren and Desert Regions incapable of Commercial Development

IENT OF THE WORLD







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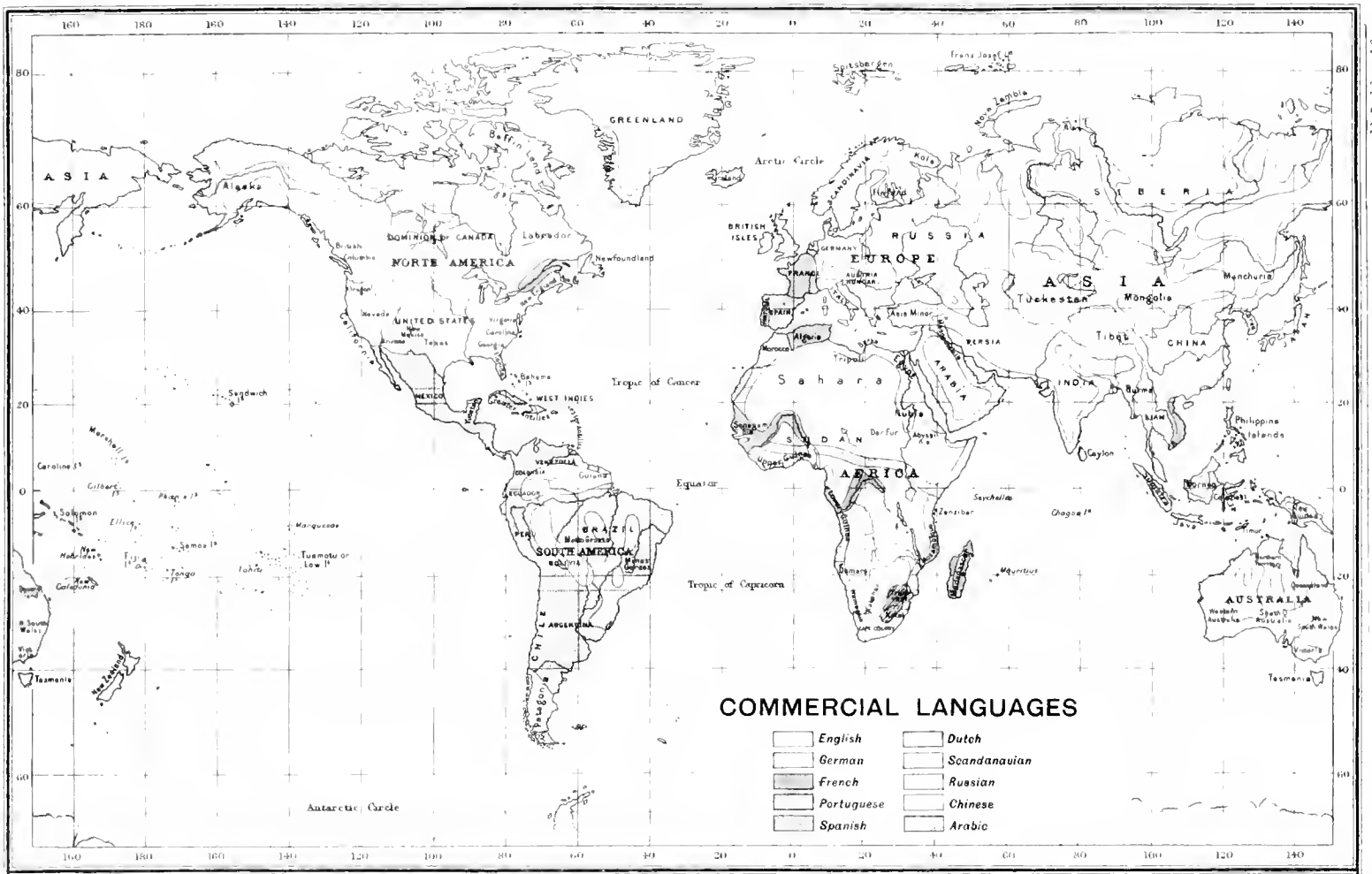

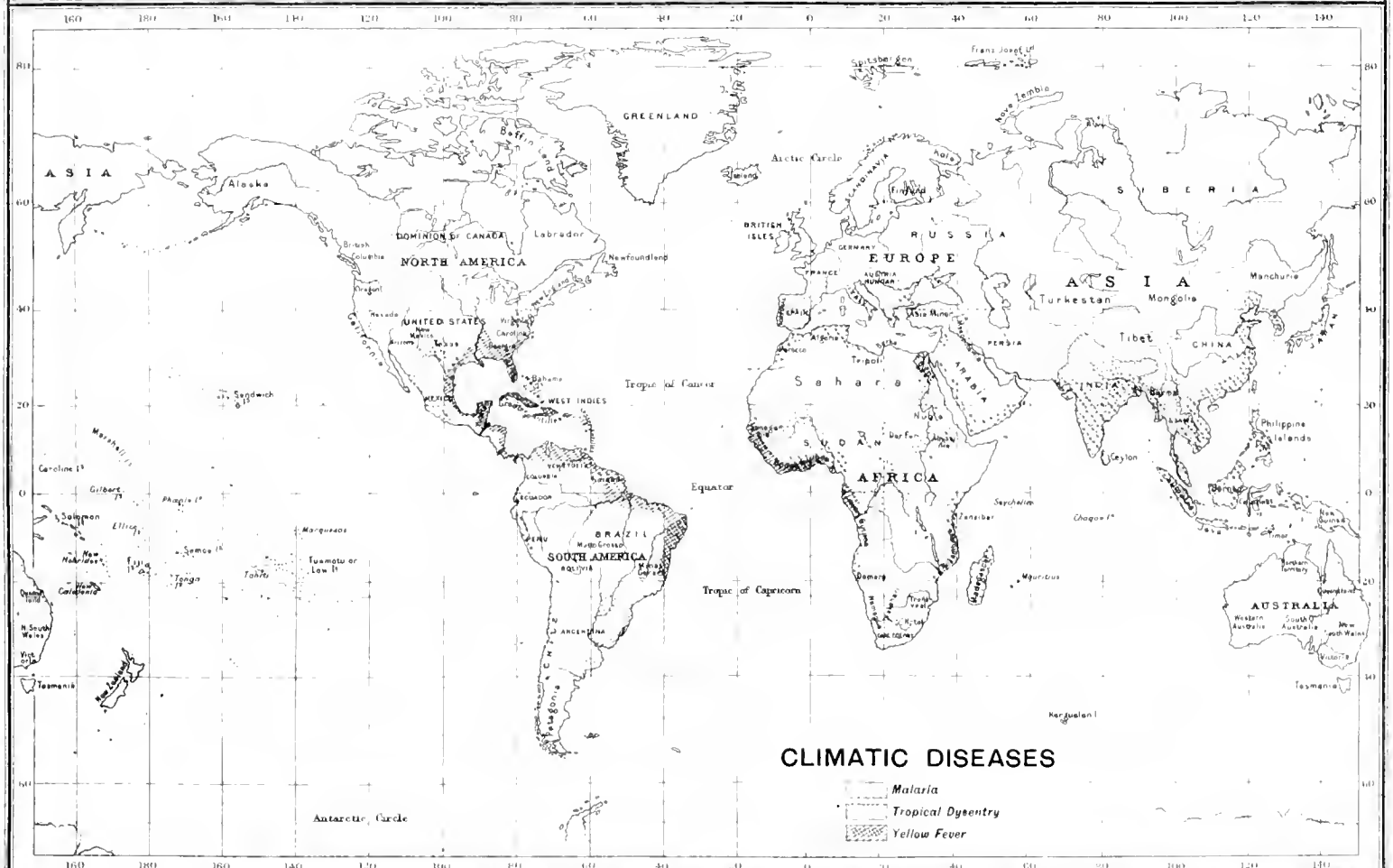

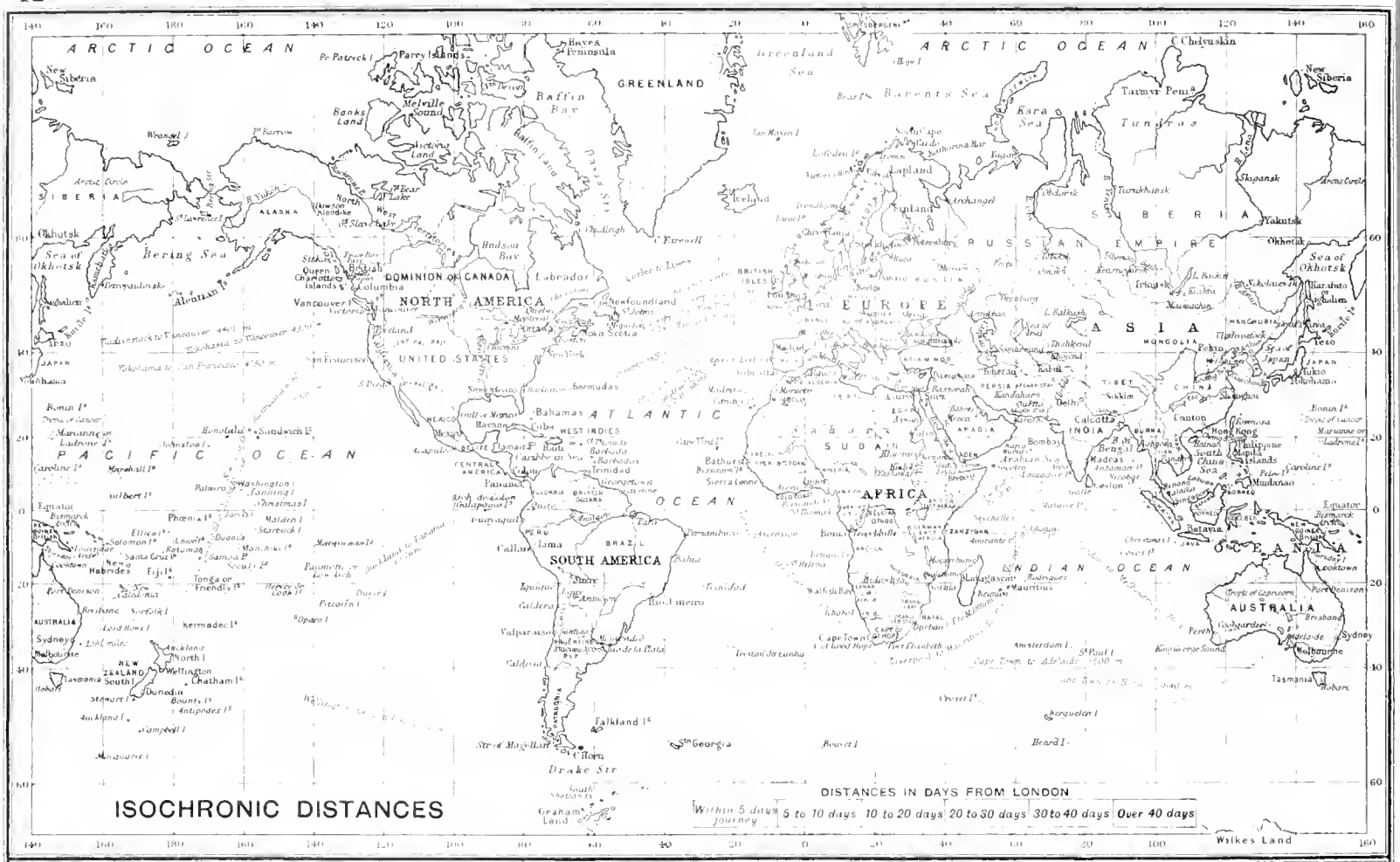

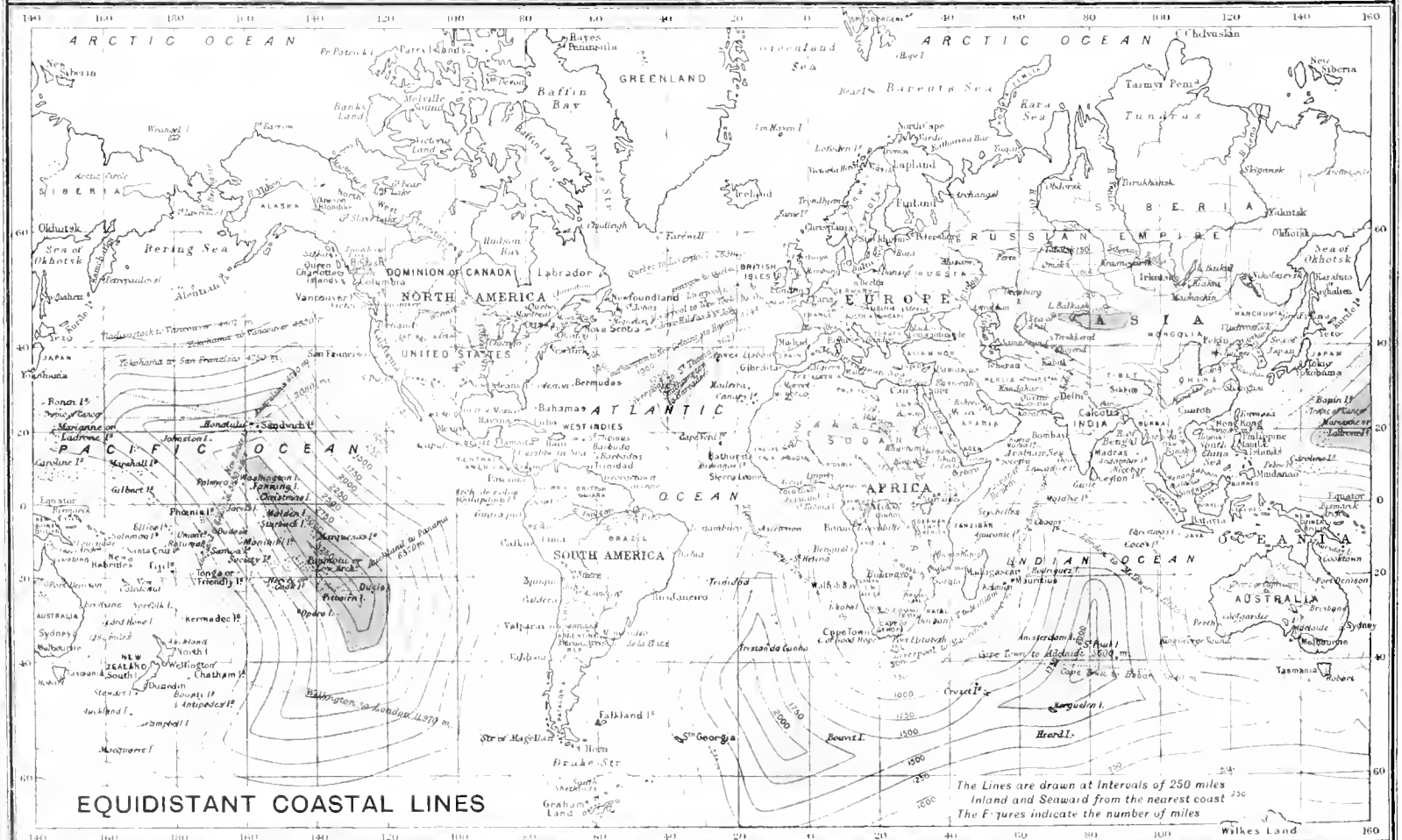

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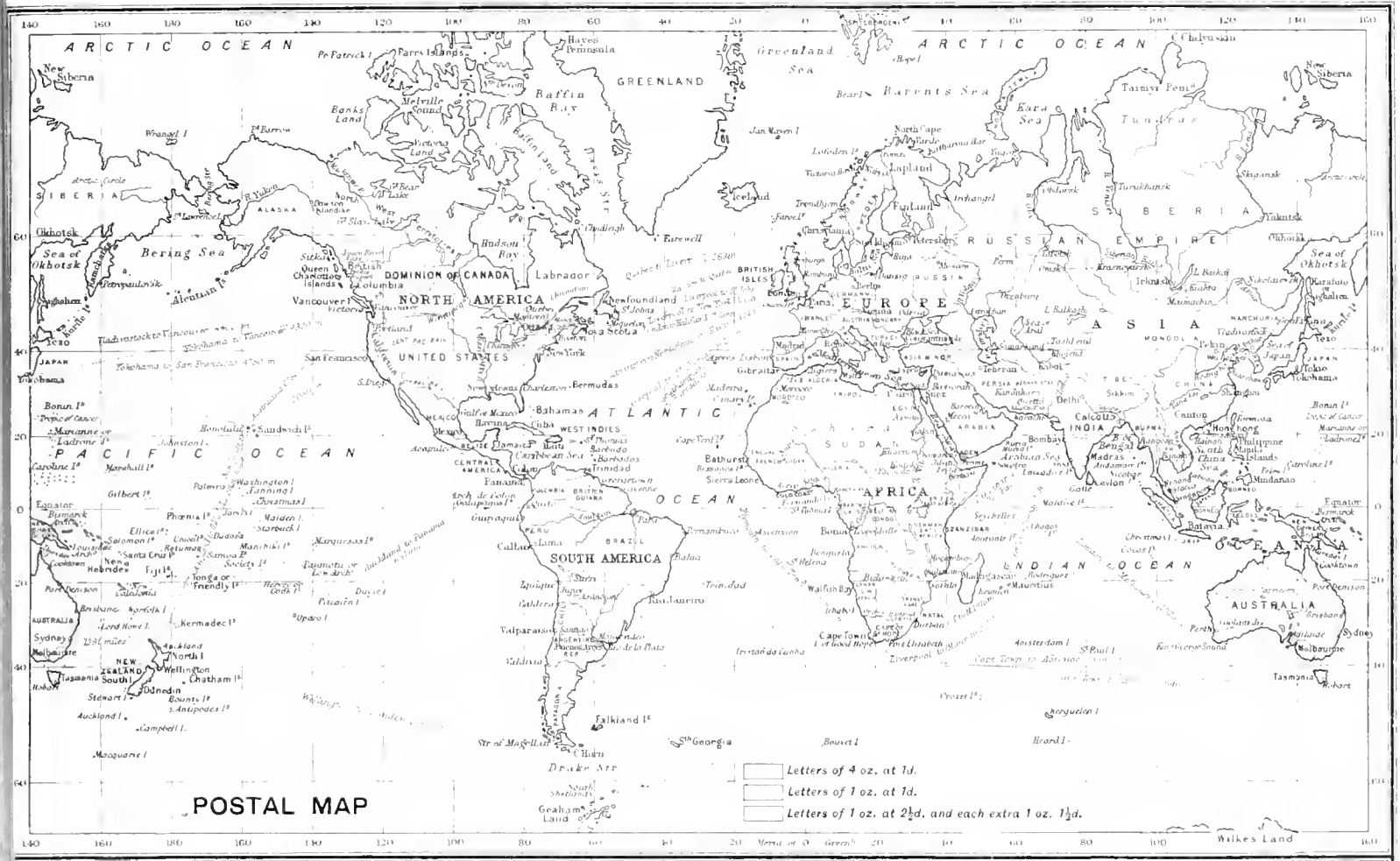
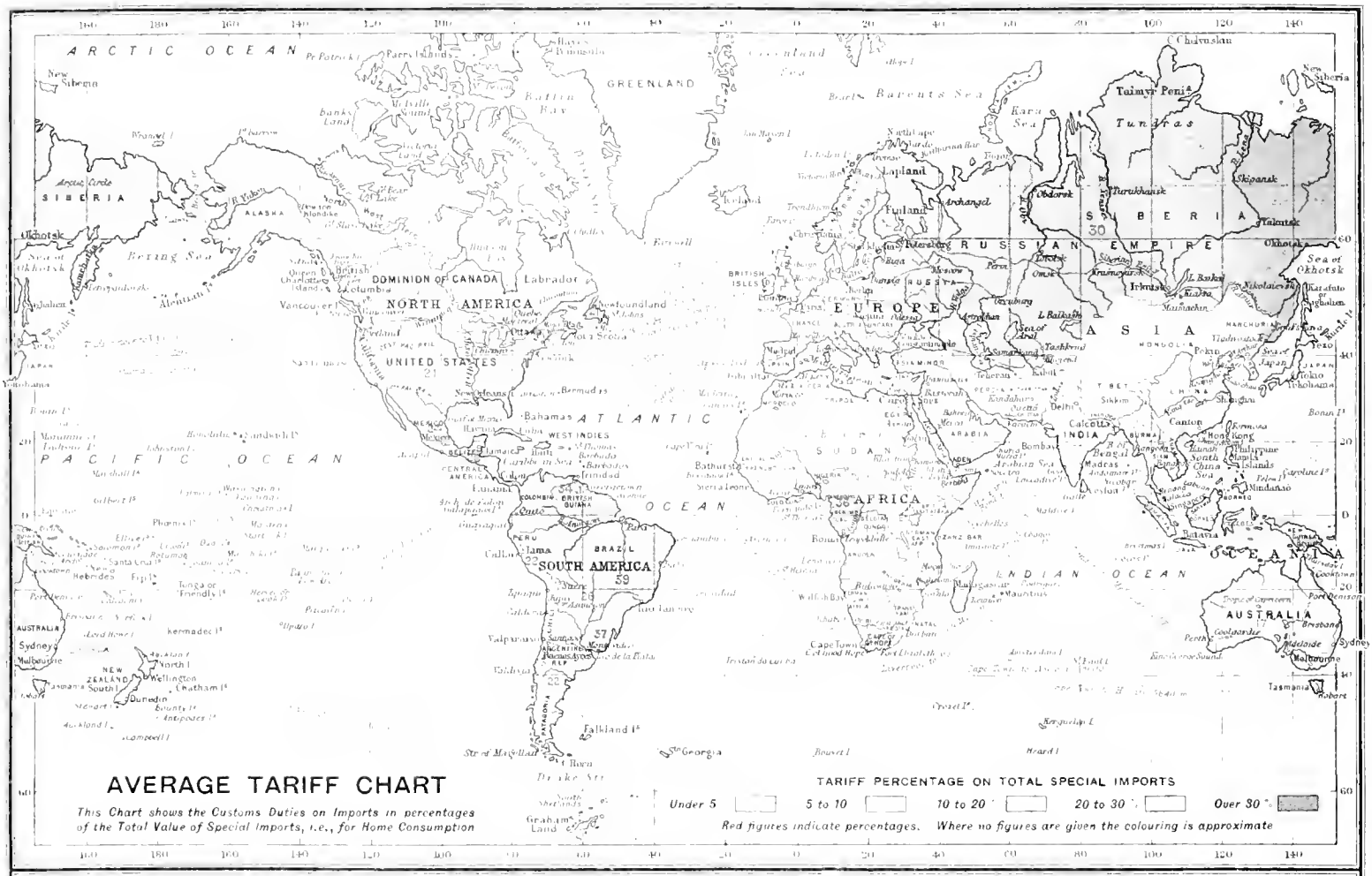
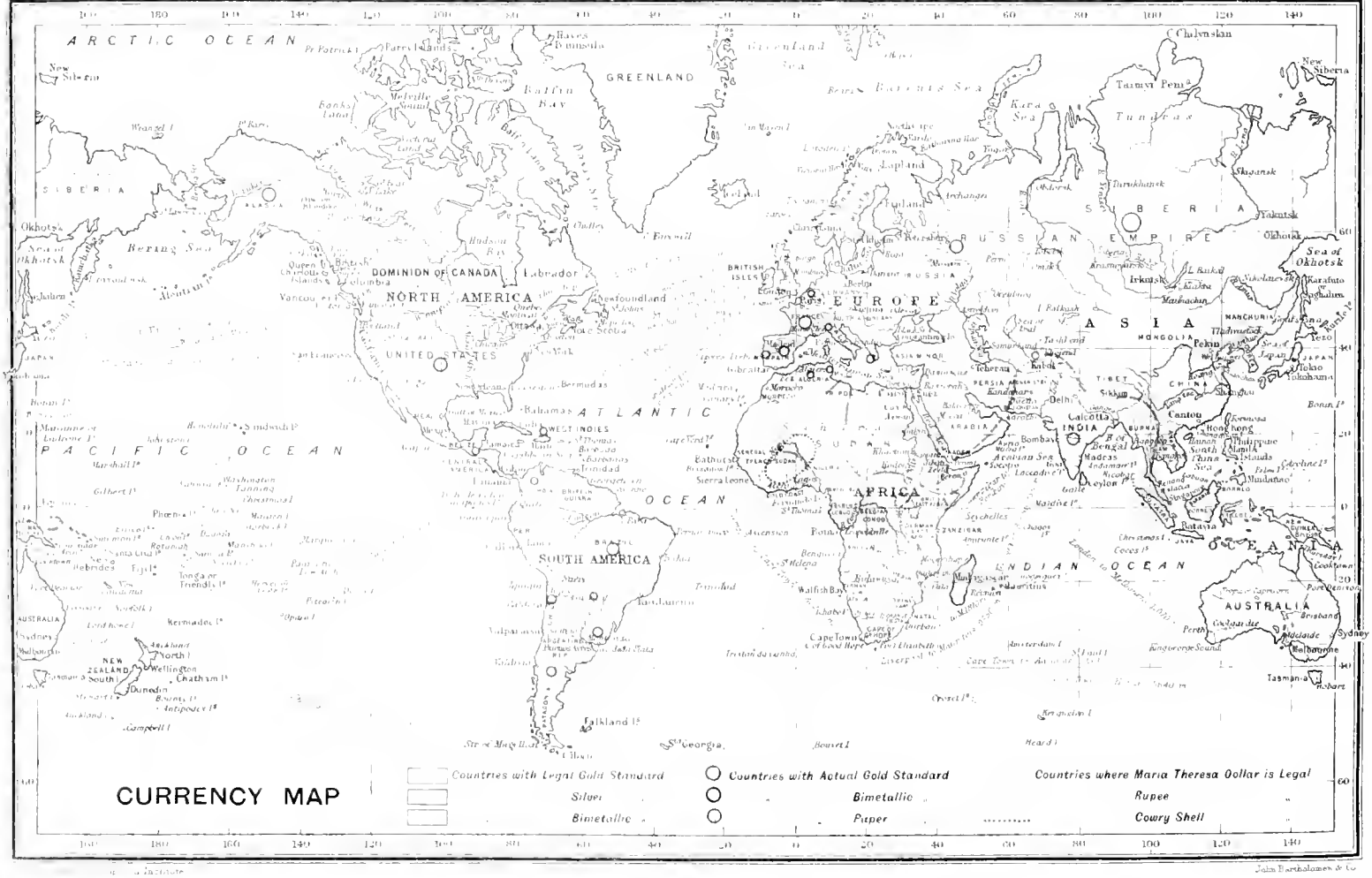

POSTAL MAP
Letters of 4 oz. at 1d.
Letters of 1 oz. at 1d.
Letters of 1 oz. at 2½d. and each extra 1 oz. 1½d.
ARCTIC OCEAN
GREENLAND
Baffin Bay
Greenland Sea
Barents Sea
Kara Sea
Tundras
SIBERIA
RUSSIAN EMPIRE
Bering Sea
Sea of Okhotsk
DOMINION OF CANADA
NORTH AMERICA
UNITED STATES
EUROPE
ASIA
ATLANTIC OCEAN
PACIFIC OCEAN
INDIAN OCEAN
SOUTH AMERICA
AFRICA
OCEANIA
AUSTRALIA
INDIA
SUDAN
BRAZIL
Drake Str.
Wilkes Land
English Miles


TELEGRAPHIC COMMUNICATIONS
Submarine Telegraph Cables, British
" " " Foreign
Land Telegraph Lines
Wireless Telegraph Stations (Public Service)
ARCTIC OCEAN
GREENLAND
Baffin Bay
Greenland Sea
Barents Sea
Kara Sea
Tundras
SIBERIA
RUSSIAN EMPIRE
Bering Sea
Sea of Okhotsk
DOMINION OF CANADA
NORTH AMERICA
UNITED STATES
EUROPE
ASIA
ATLANTIC OCEAN
PACIFIC OCEAN
INDIAN OCEAN
SOUTH AMERICA
AFRICA
OCEANIA
AUSTRALIA
INDIA
SUDAN
BRAZIL
Drake Str.
Wilkes Land



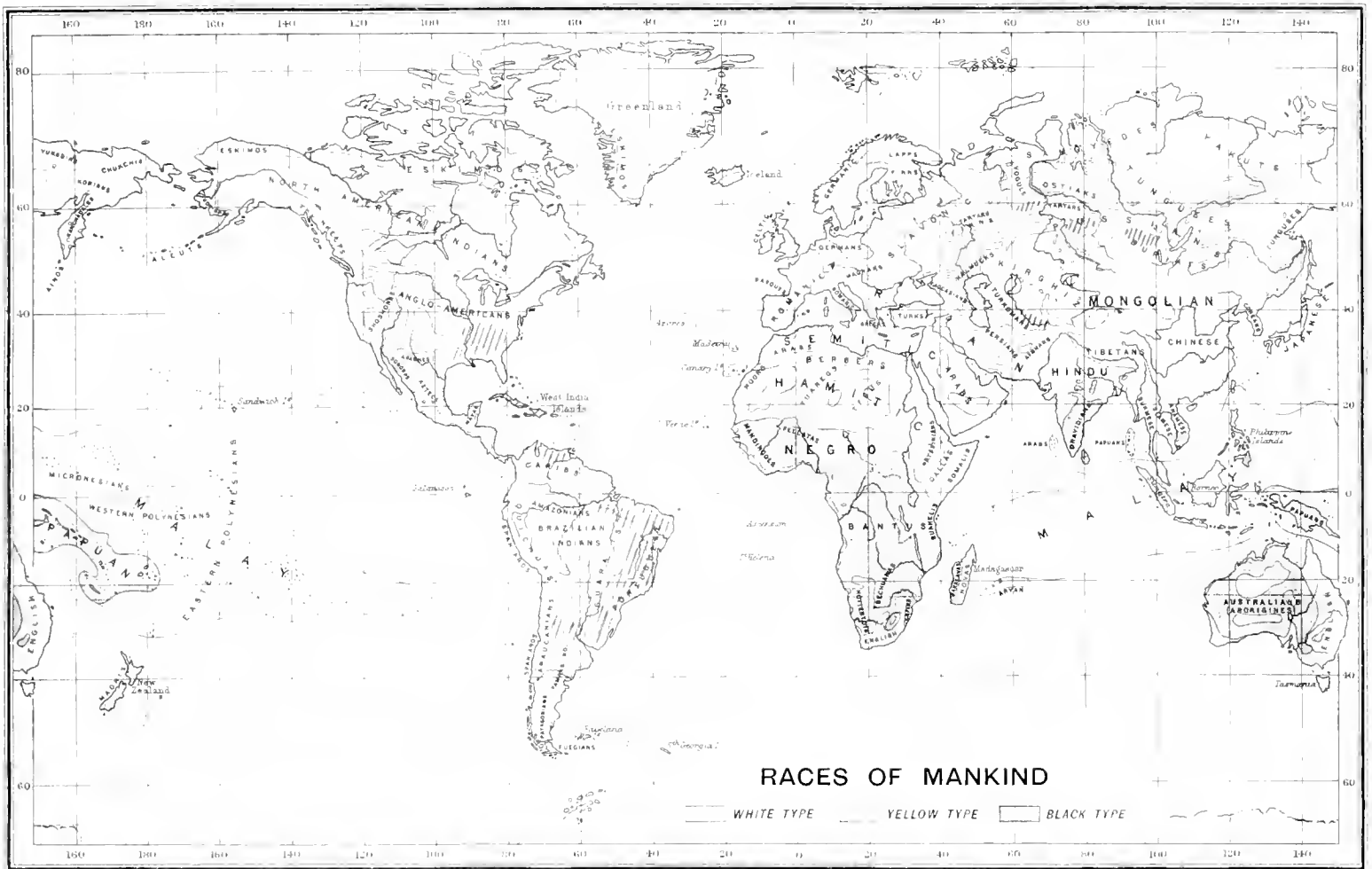
AVERAGE TARIFF CHART

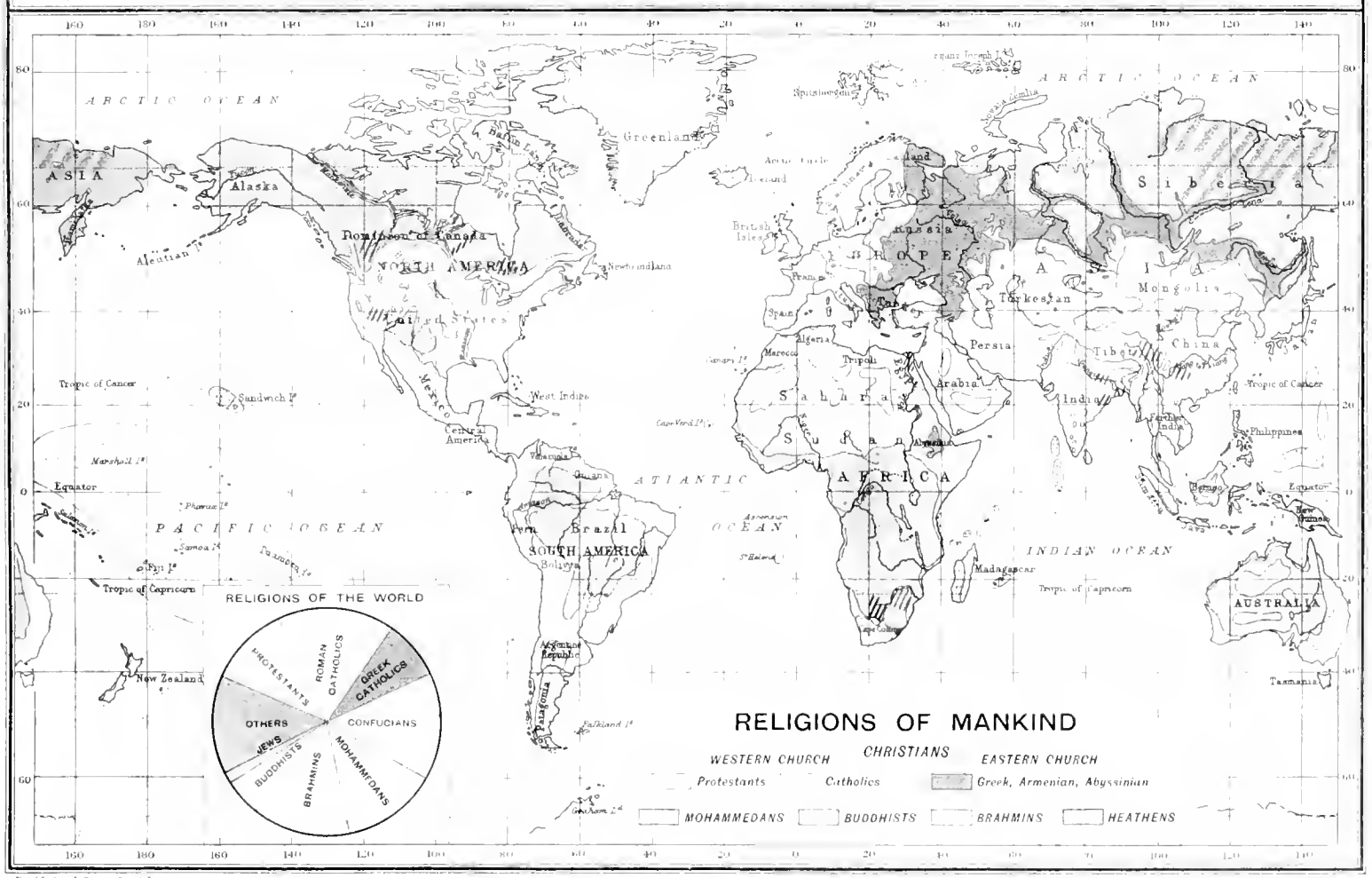
This Chart shows the Customs Duties on Imports in percentages of the Total Value of Special Imports, i.e., for Home Consumption

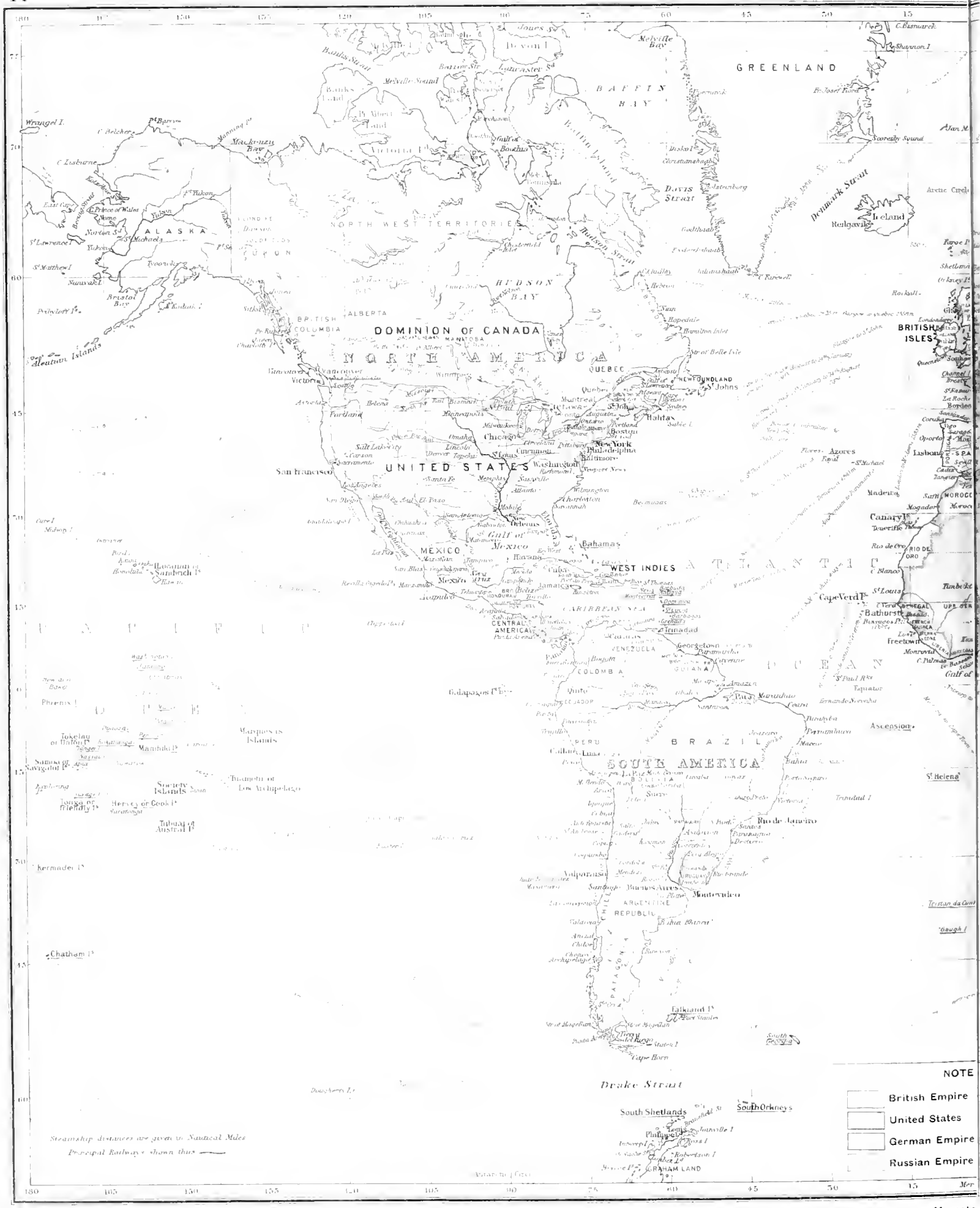


CURRENCY MAP

John Bartholomew & Co.






GREENLAND
BAFFIN BAY
Davis Strait
Denmark Strait
Iceland
Reikjavik
ALASKA
NORTH WEST TERRITORIES
YUKON
HUDSON BAY
Hudson Strait
BRITISH COLUMBIA
ALBERTA
MANITOBA
DOMINION OF CANADA
NORTH AMERICA
QUEBEC
NEWFOUNDLAND
St Johns
Halifax
Montreal
Ottawa
Toronto
Winnipeg
Vancouver
Victoria
Portland
Chicago
New York
Philadelphia
Baltimore
Washington
San Francisco
UNITED STATES
Salt Lake City
Denver
St Louis
Cincinnati
Pittsburg
Boston
Omaha
Atlanta
Charleston
Savannah
Wilmington
Norfolk
Bermudas
Mobile
New Orleans
Gulf of Mexico
Florida
Bahamas
Cuba
Havana
WEST INDIES
MEXICO
Mexico
Jamaica
Kingston
CARIBBEAN SEA
CENTRAL AMERICA
Trinidad
VENEZUELA
Georgetown
GUIANA
COLOMBIA
Bogota
Quito
Galapagos Is
PERU
Lima
BRAZIL
SOUTH AMERICA
BOLIVIA
Rio de Janeiro
Valparaiso
Santiago
Buenos Aires
Montevideo
CHILE
ARGENTINE REPUBLIC
PATAGONIA
Falkland Is
Port Stanley
Cape Horn
Drake Strait
South Shetlands
South Orkneys
Graham Land
Azores
Lisbon
PORTUGAL
SPAIN
Madeira
Canary Is
Tenerife
MOROCCO
Cape Verd Is
Bathurst
Freetown
SENEGAL
Rio de Oro
RIO DE ORO
St Louis
Ascension
St Helena
Tristan da Cunha
Gough I
Trinidad I
Fernando Noronha
Equator
Gulf of Guinea
Behring Sea
Behring Strait
Wrangel I.
Barrow
Mackenzie Bay
Victoria I
Banks Land
Melville Island
Melville Bay
Lancaster Sd
Baffin Land
Devon I
Jones Sd
Smith Sd
Kennedy Channel
Robeson Channel
Kane Basin
Kane Sea
Hall Basin
Frobisher Bay
Cumberland Sound
Davis Strait
Disko I
Godthaab
Julianehaab
Scoresby Sound
Jan Mayen
Arctic Circle
Reykjavik
Faroe Is
Shetland Is
Orkney Is
Rockall
BRITISH ISLES
Aleutian Islands
Kamtschatka
Behring Sea
Behring Strait
Bristol Bay
Kuskokwim
Yukon
Mackenzie
Liverpool
Bordeaux
Corunna
Oporto
Lisbon
Gibraltar
Tangier
Madeira
Canary Is
Cape Verd Is
Bathurst
Freetown
Monrovia
Ascension
St Helena
Tristan da Cunha
Gough I
Trinidad I
Fernando Noronha
Rio de Janeiro
Montevideo
Buenos Aires
Valparaiso
Falkland Is
Cape Horn
Drake Strait
South Shetlands
South Orkneys
Graham Land
Hawaiian Is
Phoenix I
Tokelau or Union Is
Manihiki Is
Marquesas Islands
Society Islands
Tonga or Friendly Is
Harvey or Cook Is
Tubuai Is
Austral Is
Low Archipelago
Samoa or Navigator Is
Kermadec Is
Chatham Is
Midway I
Line Is
Fanning I
Christmas I
Gilbert Is
Ellice Is
Solomon Is
New Britain
New Ireland
Bismarck Archipelago
Admiralty Is
Caroline Is
Pelew Is
Ladrone Is
Philippine Is
Manila
Formosa
Japan
Yokohama
Nagasaki
Hong Kong
Canton
Amoy
Shanghai
Pekin
Corea
Vladivostock
Saghalien
Kamtschatka
Behring Sea
Behring Strait
Aleutian Islands
Steamship distances are given in Nautical Miles
Principal Railways shown thus
NOTE
British Empire
United States
German Empire
Russian Empire
Mercato

COLOURING

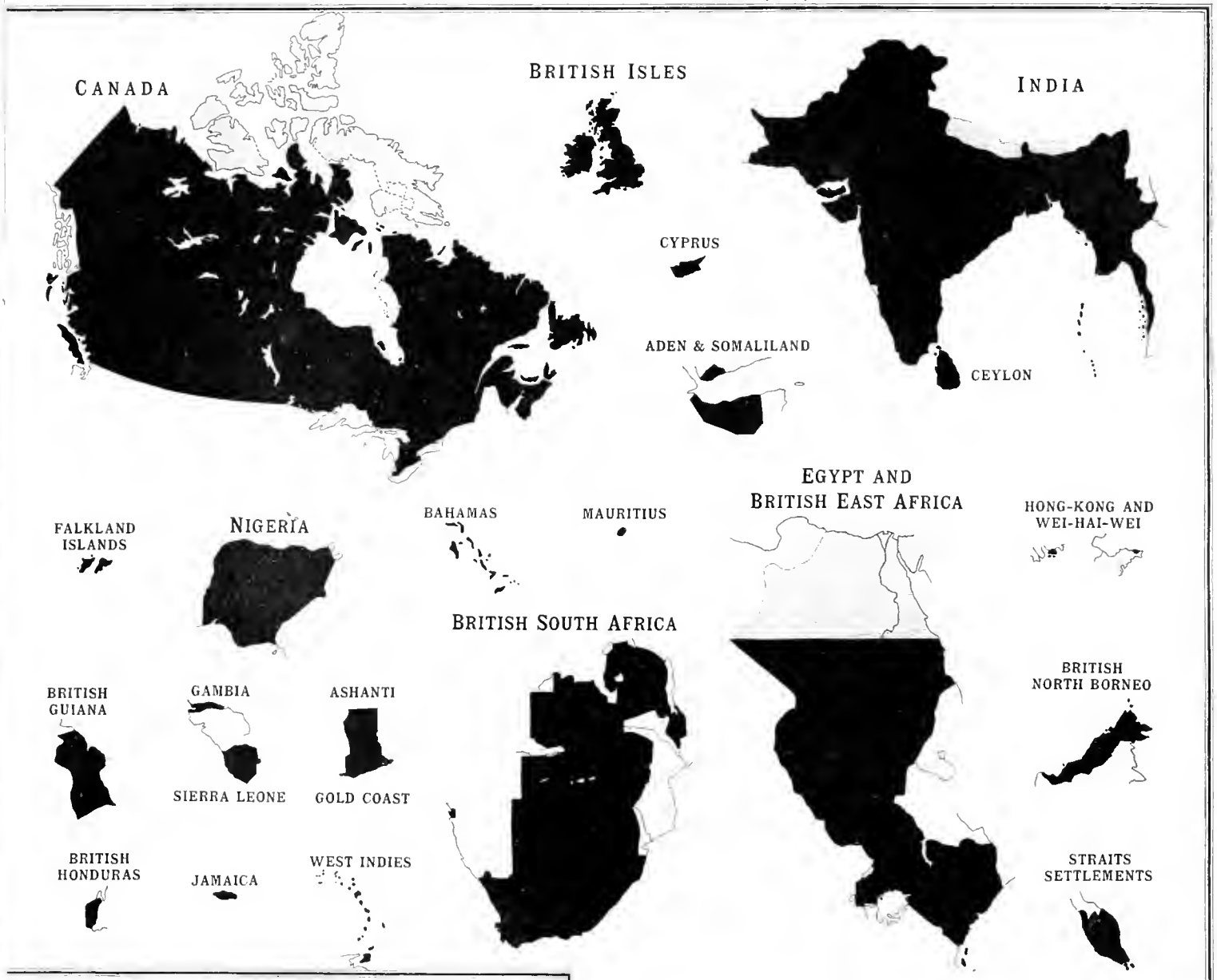
- French Possessions
- Portugese Possessions
- Dutch Possessions
- Chinese Possessions

English Miles

rojection

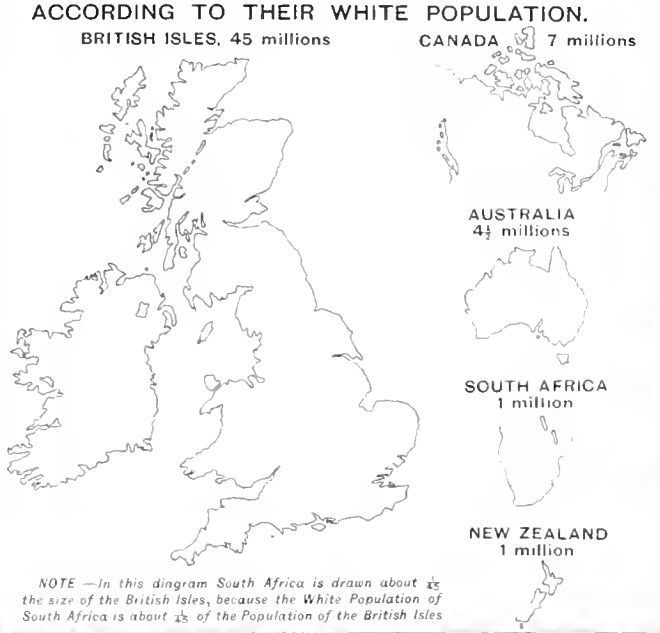
COUNTRIES OF THE BRITISH EMPIRE

DRAWN ON A UNIFORM SCALE OF 1 = 60,000,000



COUNTRIES OF THE BRITISH EMPIRE

DRAWN ON A UNIFORM SCALE
ACCORDING TO THEIR WHITE POPULATION.



NOTE —In this diagram South Africa is drawn about $\frac{1}{25}$ the size of the British Isles, because the White Population of South Africa is about $\frac{1}{25}$ of the Population of the British Isles

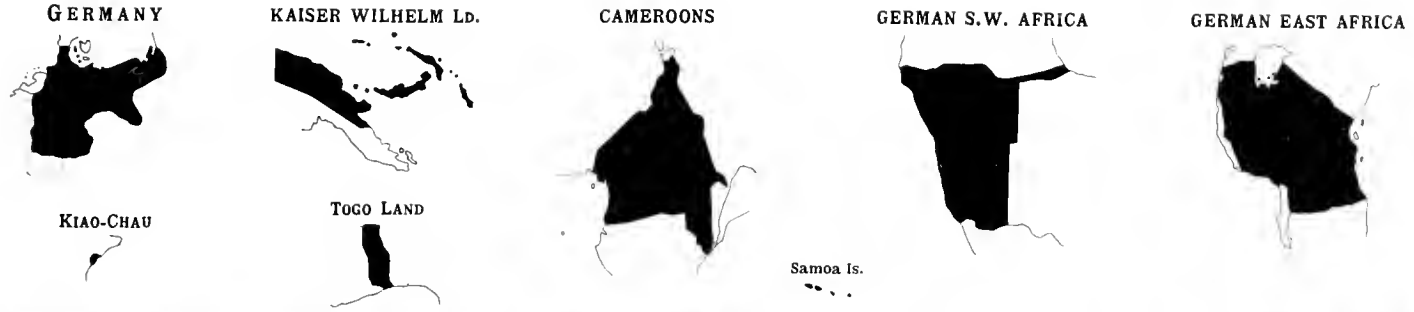
The Edinburgh Geographical Institute

John Bartholomew & Co

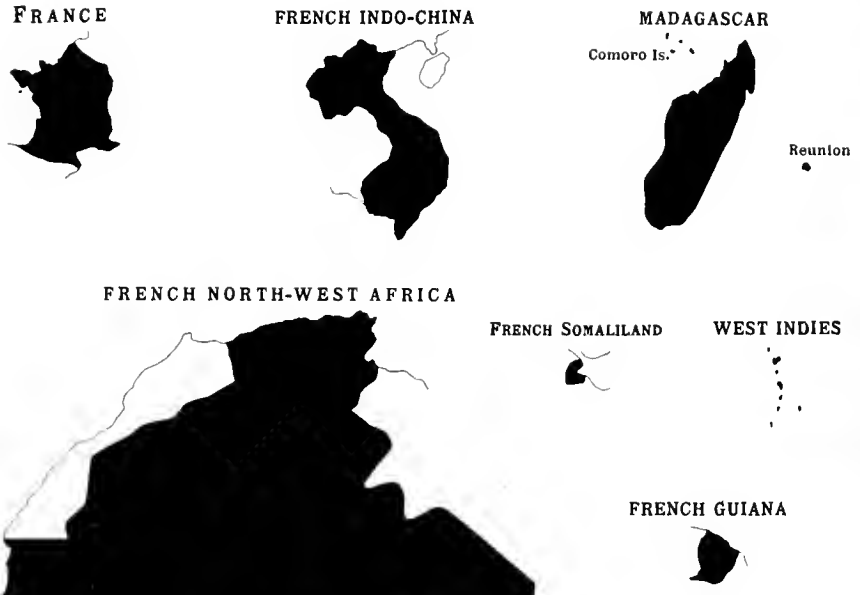
COUNTRIES OF OTHER COLONIAL POWERS

DRAWN ON A UNIFORM SCALE OF 1=60,000,000

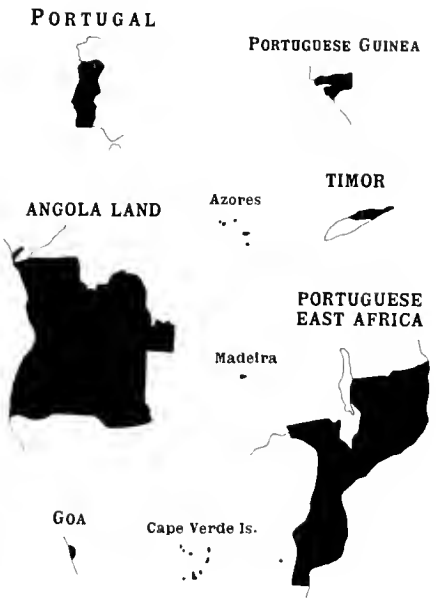
GERMAN



FRENCH



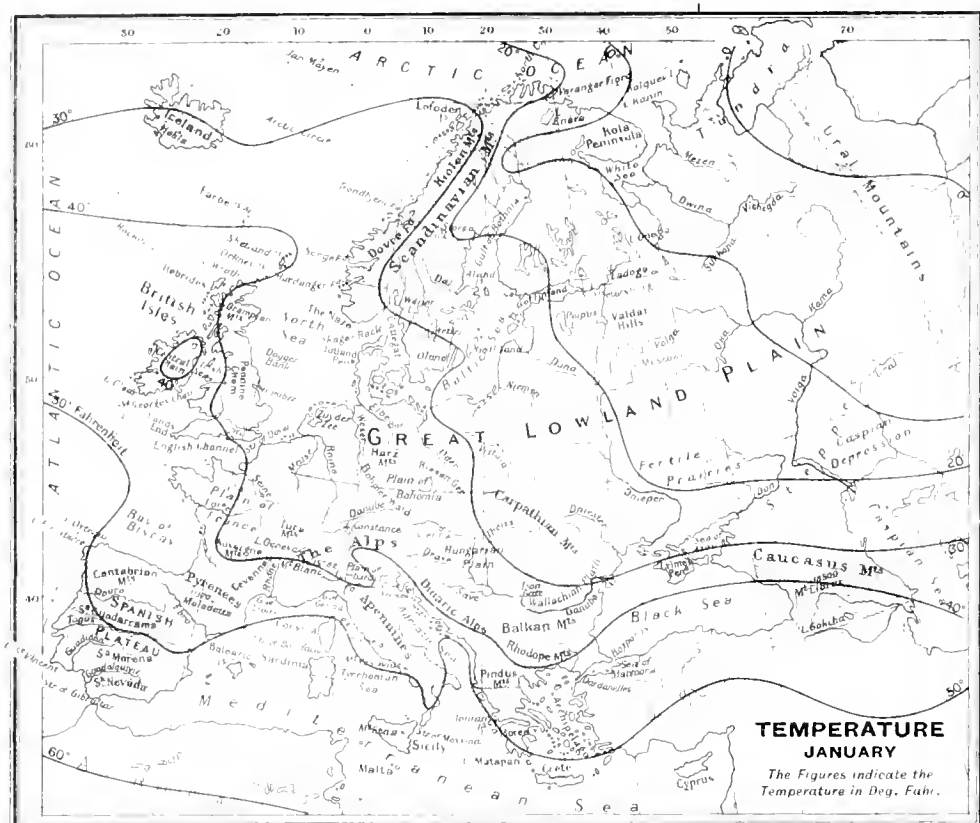
PORTUGUESE

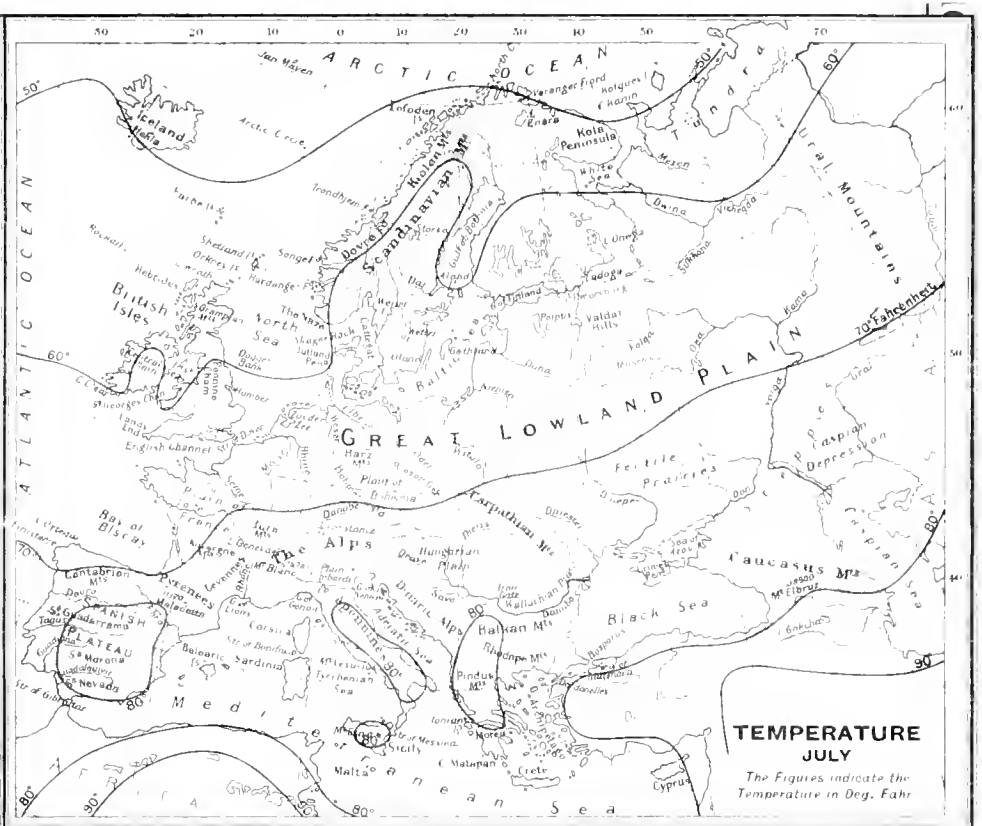


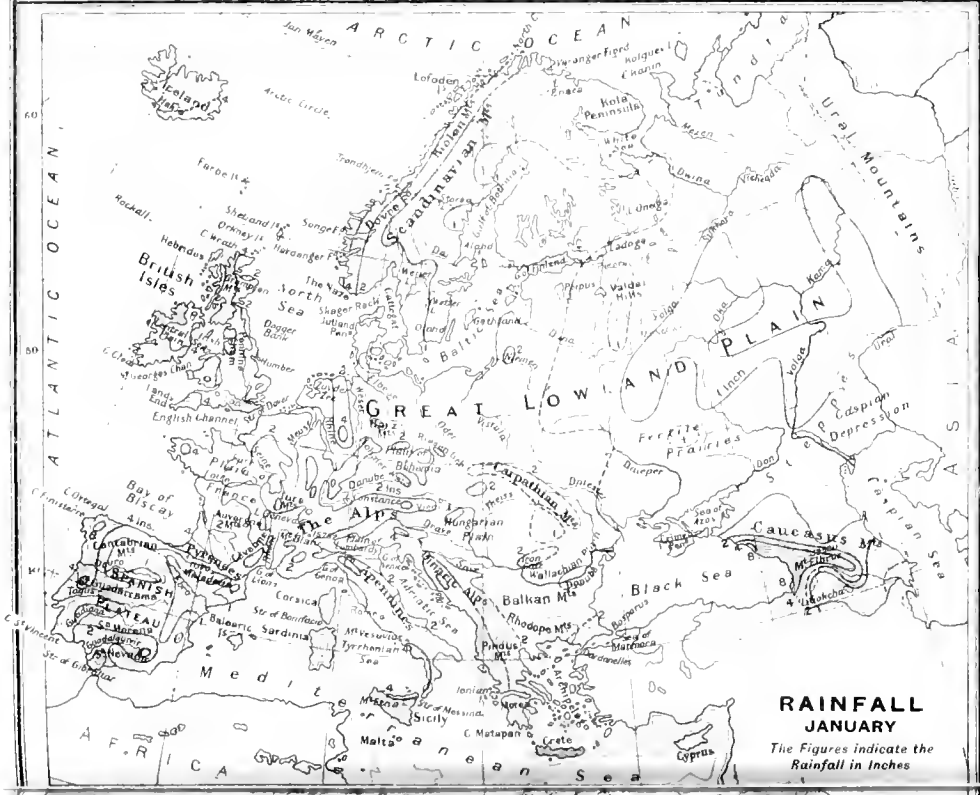
UNITED STATES

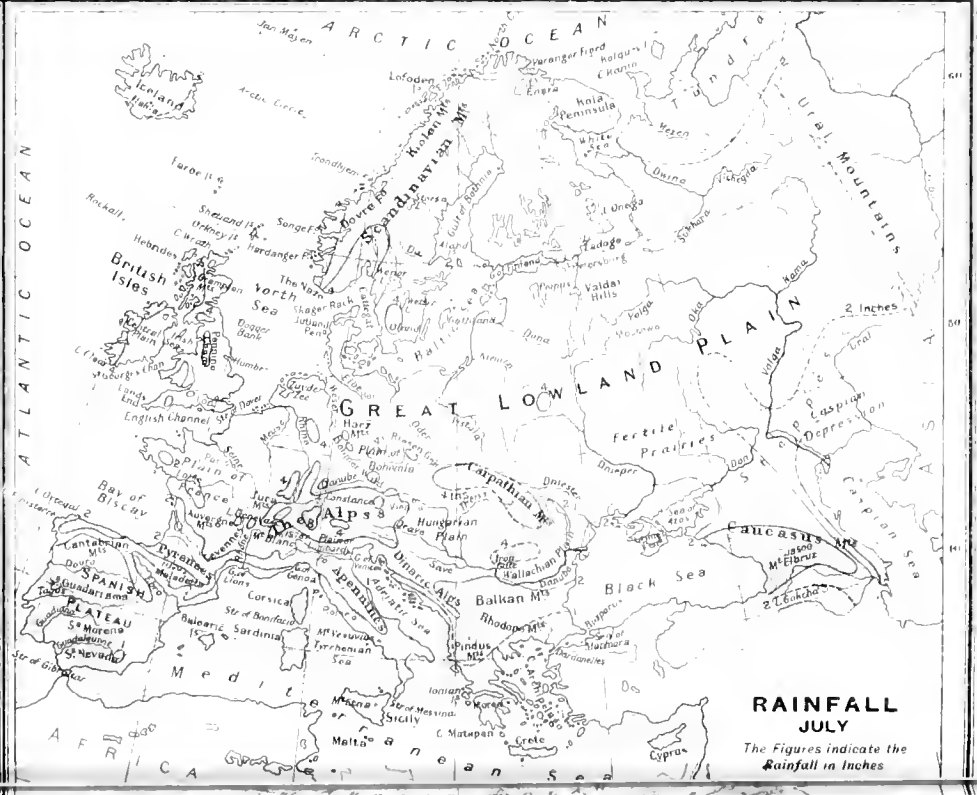
DUTCH

English Miles 0 500 1000


ARCTIC OCEAN
ATLANTIC OCEAN
Iceland
British Isles
North Sea
Scandinavian Mts
Dovre Mts
Lofoten
Kola Peninsula
Tundra
Ural Mountains
GREAT LOWLAND PLAIN
Fertile Prairies
Caspian Depression
Caspian Sea
Black Sea
Baltic Sea
Bay of Biscay
English Channel
The Alps
Carpathian Mts
Caucasus Mts
Balkan Mts
Rhodope Mts
Pyrenees
Apennines
Dinaric Alps
SPANISH PLATEAU
Sierra Nevada
Corsica
Sicily
Cyprus
Crete
Malta
Mediterranean Sea
AFRICA
50° Fahrenheit
TEMPERATURE
JANUARY
The Figures indicate the Temperature in Deg. Fahr.


ARCTIC OCEAN
ATLANTIC OCEAN
Iceland
British Isles
North Sea
Scandinavian Mts
Dovre Mts
Lofoten
Kola Peninsula
Tundra
Ural Mountains
GREAT LOWLAND PLAIN
Fertile Prairies
Caspian Depression
Caspian Sea
Black Sea
Baltic Sea
Bay of Biscay
English Channel
The Alps
Carpathian Mts
Caucasus Mts
Balkan Mts
Rhodope Mts
Pyrenees
Apennines
Dinaric Alps
SPANISH PLATEAU
Sierra Nevada
Corsica
Sicily
Cyprus
Crete
Malta
Mediterranean Sea
AFRICA
70° Fahrenheit
TEMPERATURE
JULY
The Figures indicate the Temperature in Deg. Fahr.


ARCTIC OCEAN
ATLANTIC OCEAN
Iceland
British Isles
North Sea
Scandinavian Mts
Dovre Mts
Lofoten
Kola Peninsula
Tundra
Ural Mountains
GREAT LOWLAND PLAIN
Fertile Prairies
Caspian Depression
Caspian Sea
Black Sea
Baltic Sea
Bay of Biscay
English Channel
The Alps
Carpathian Mts
Caucasus Mts
Balkan Mts
Rhodope Mts
Pyrenees
Apennines
Dinaric Alps
SPANISH PLATEAU
Sierra Nevada
Corsica
Sicily
Cyprus
Crete
Malta
Mediterranean Sea
AFRICA
RAINFALL
JANUARY
The Figures indicate the Rainfall in Inches


ARCTIC OCEAN
ATLANTIC OCEAN
Iceland
British Isles
North Sea
Scandinavian Mts
Dovre Mts
Lofoten
Kola Peninsula
Tundra
Ural Mountains
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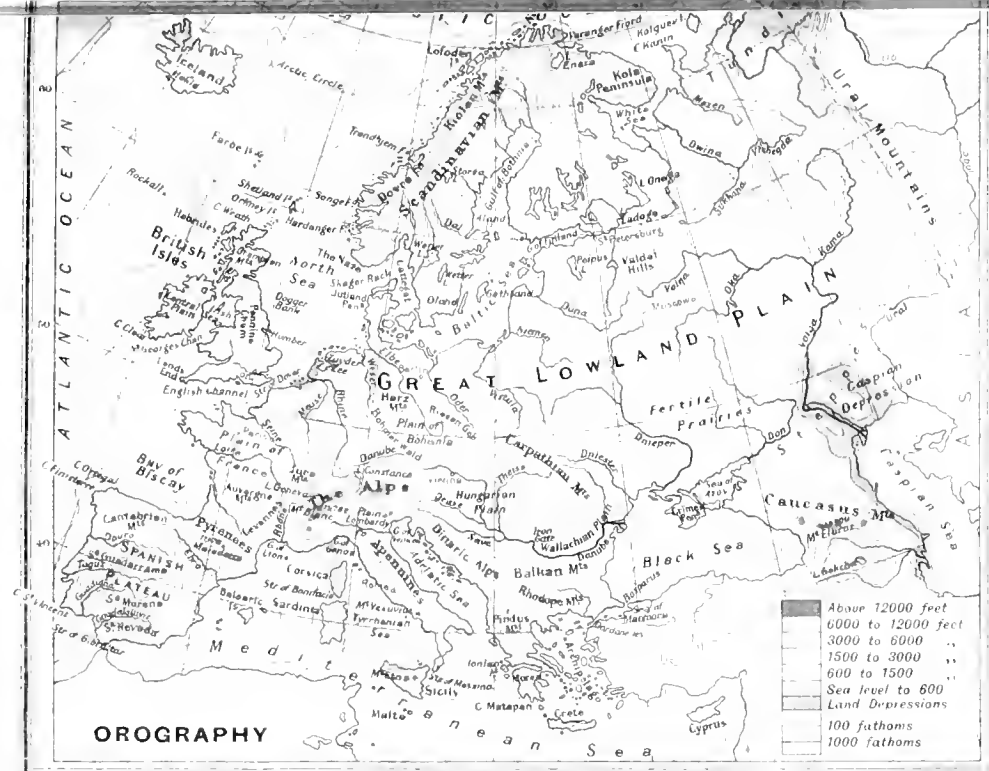
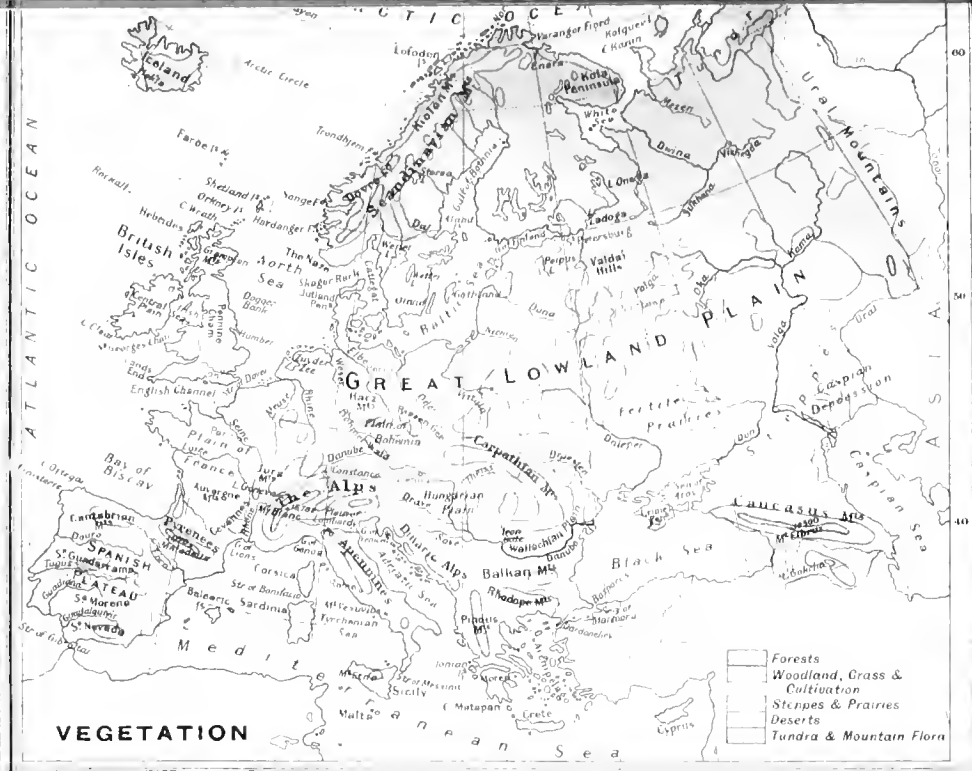
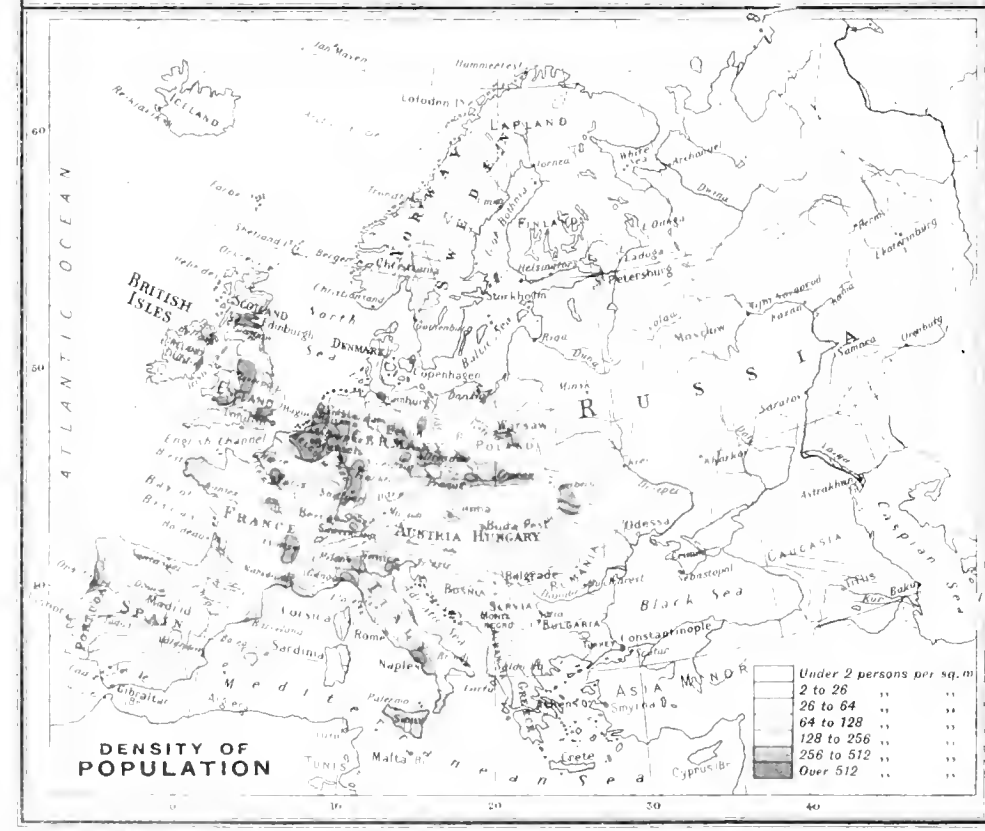
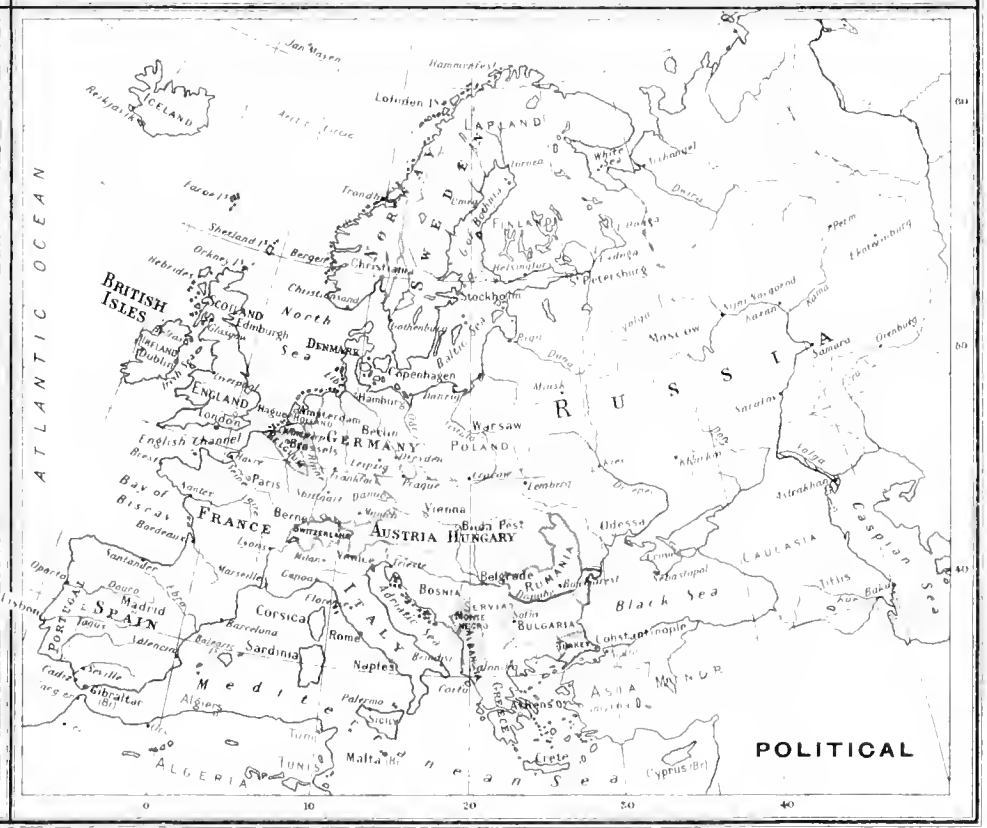
Caucasus Mts
Balkan Mts
Rhodope Mts
Pyrenees
Apennines
Dinaric Alps
SPANISH PLATEAU
Sierra Nevada
Corsica
Sicily
Cyprus
Crete
Malta
Mediterranean Sea
AFRICA
RAINFALL
JULY
The Figures indicate the Rainfall in Inches





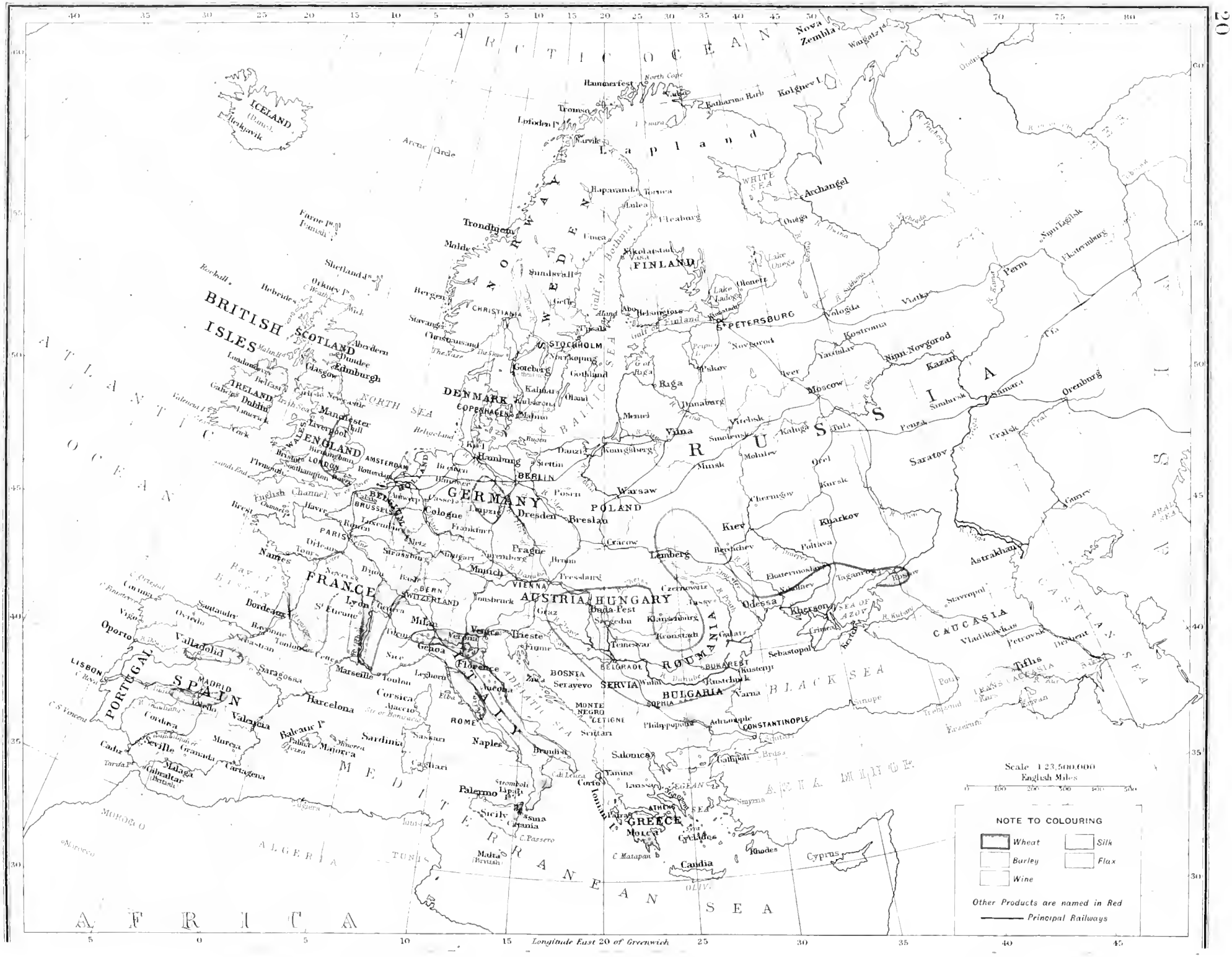




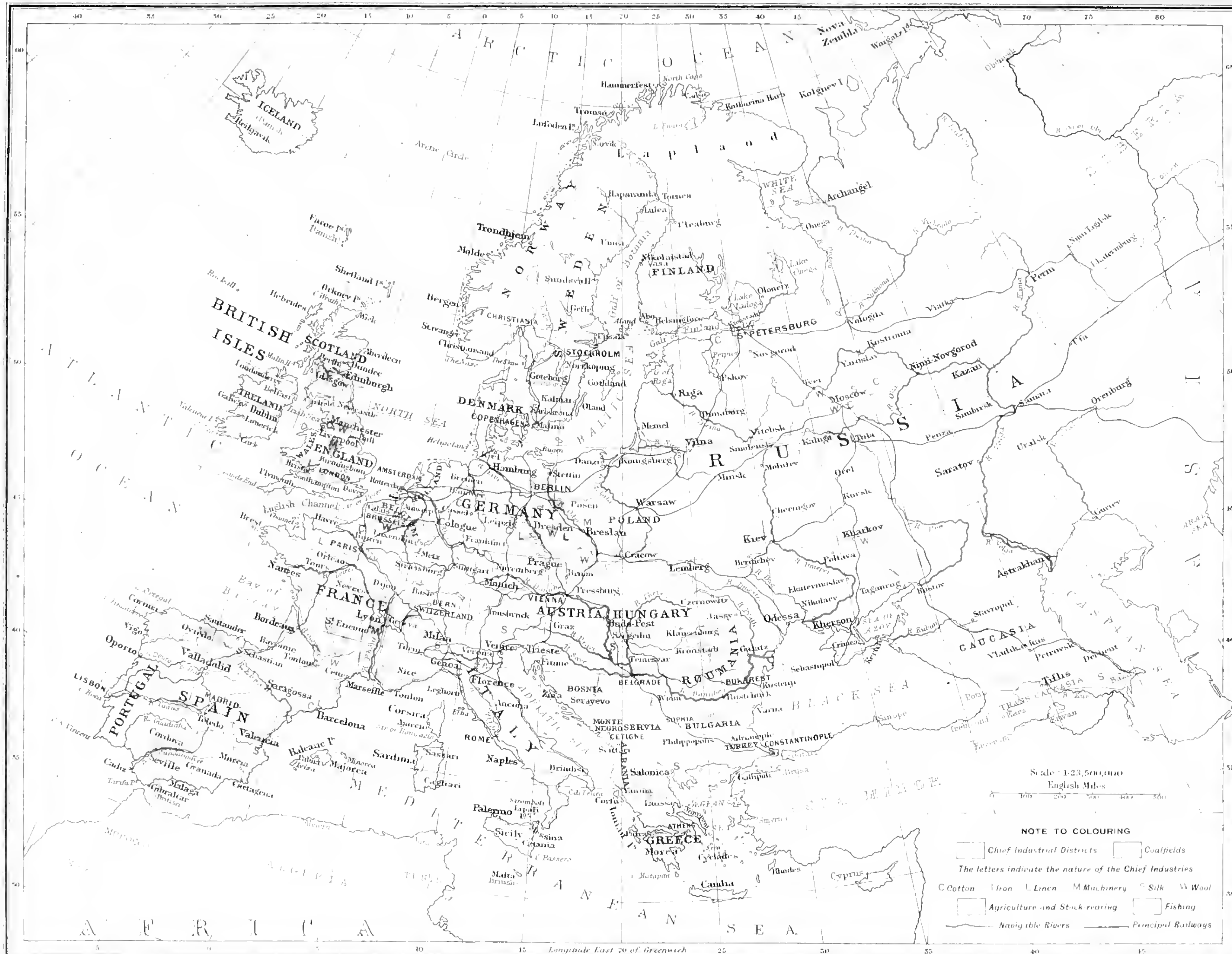
English Miles

John Bartholomew & Co

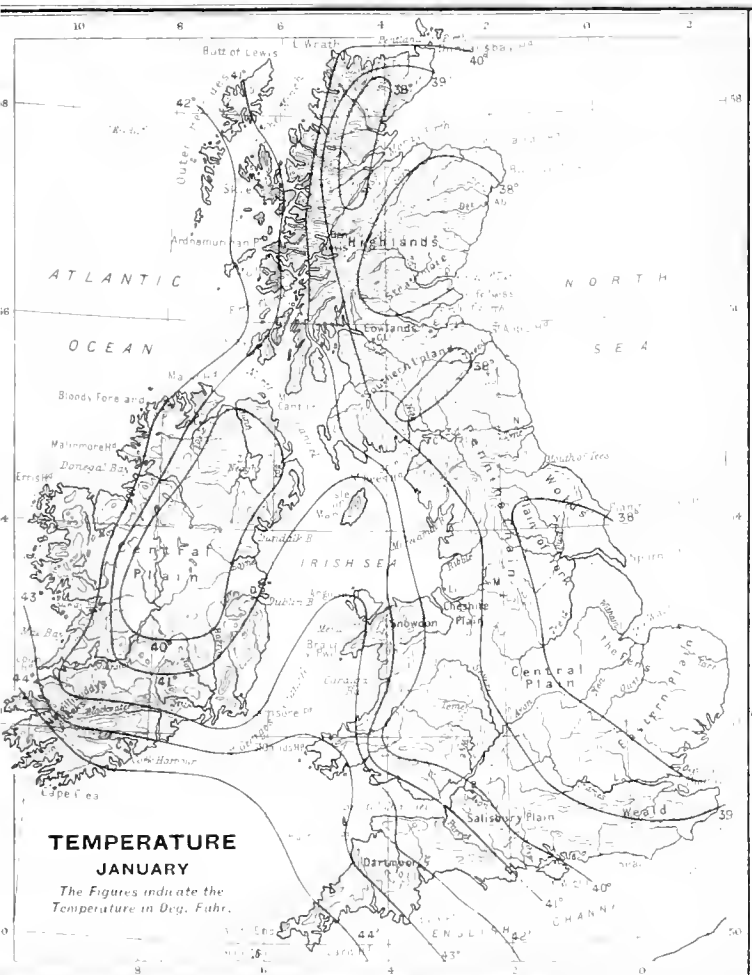
ECONOMIC MAP OF EUROPE

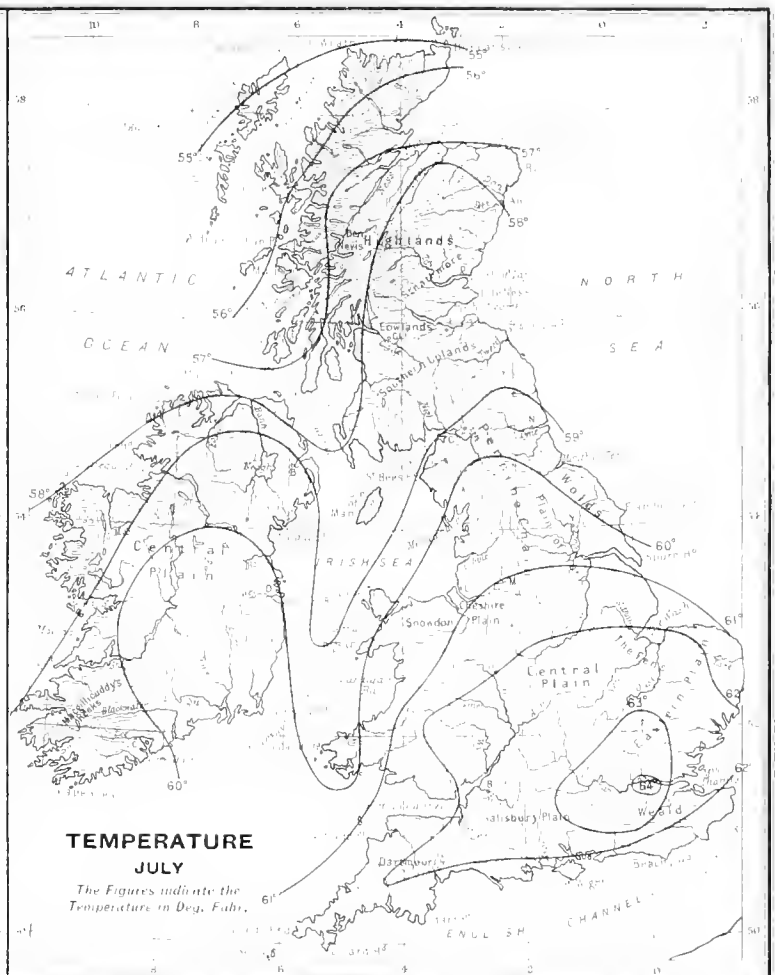


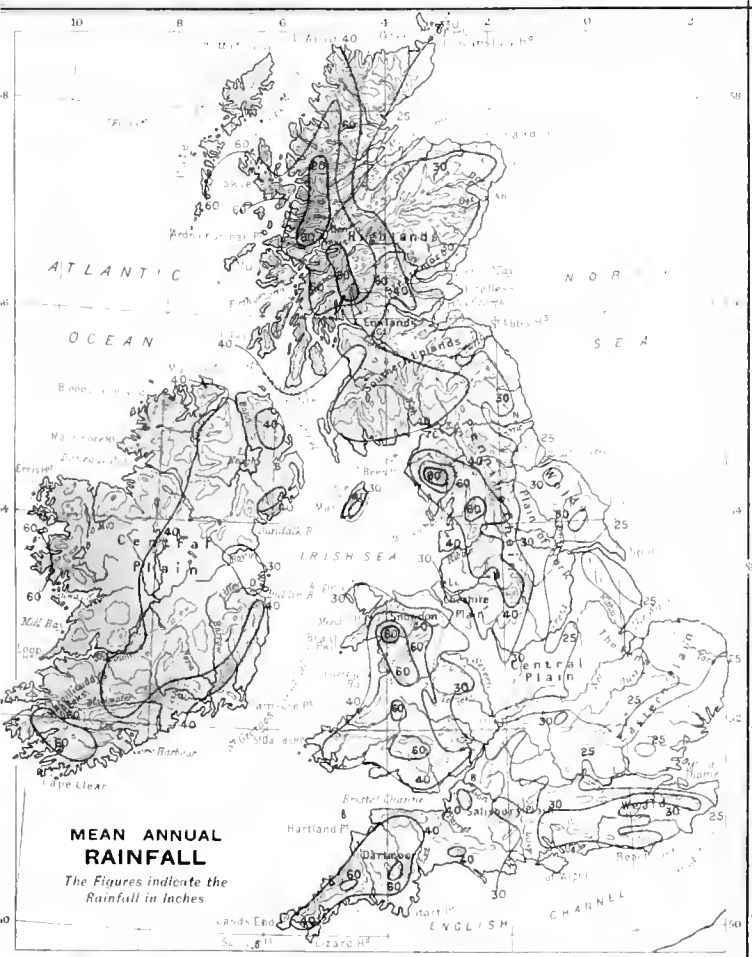
INDUSTRIAL MAP OF EUROPE.

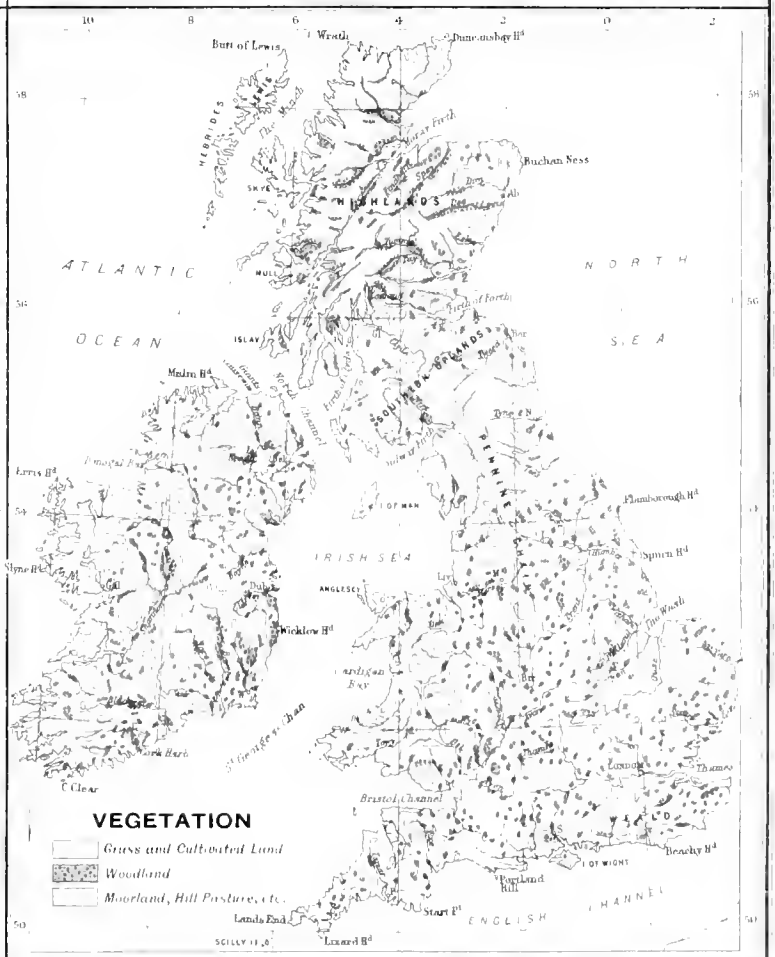


BRITISH ISLES BATHY-OROGRAPHICAL



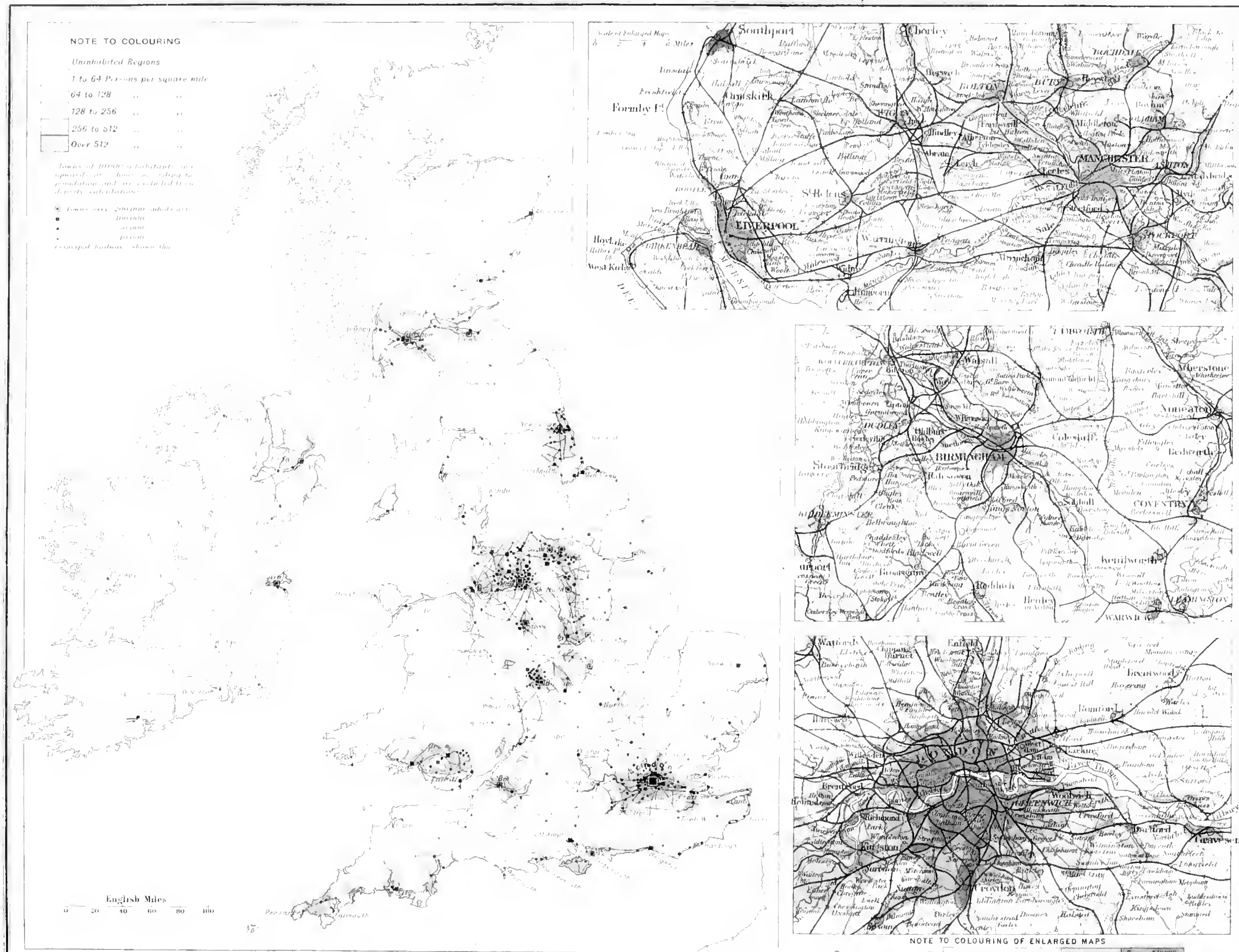


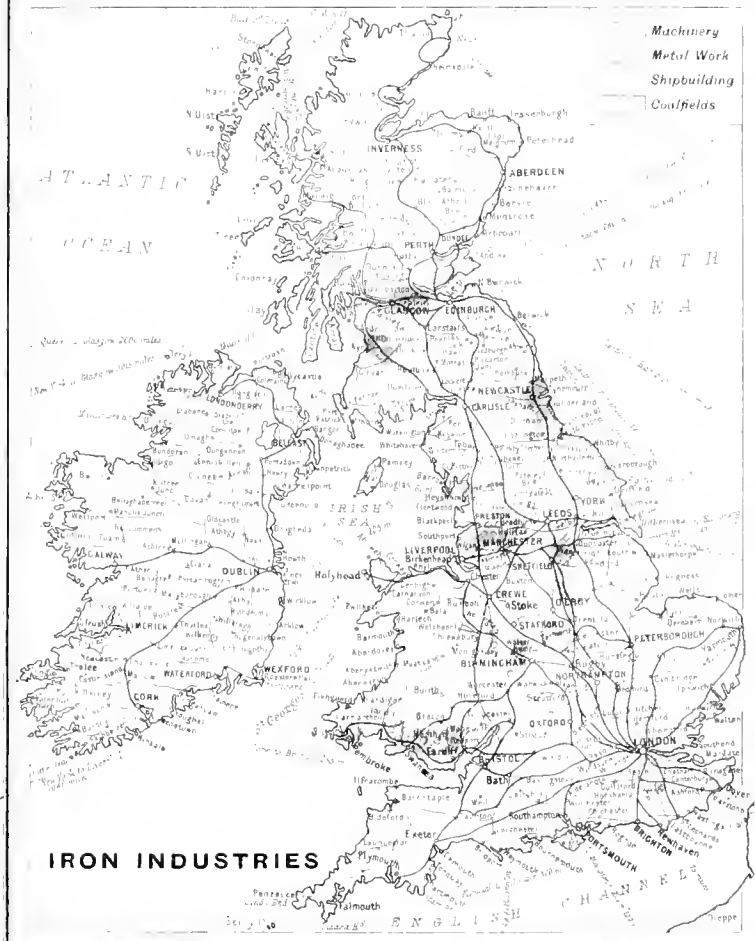


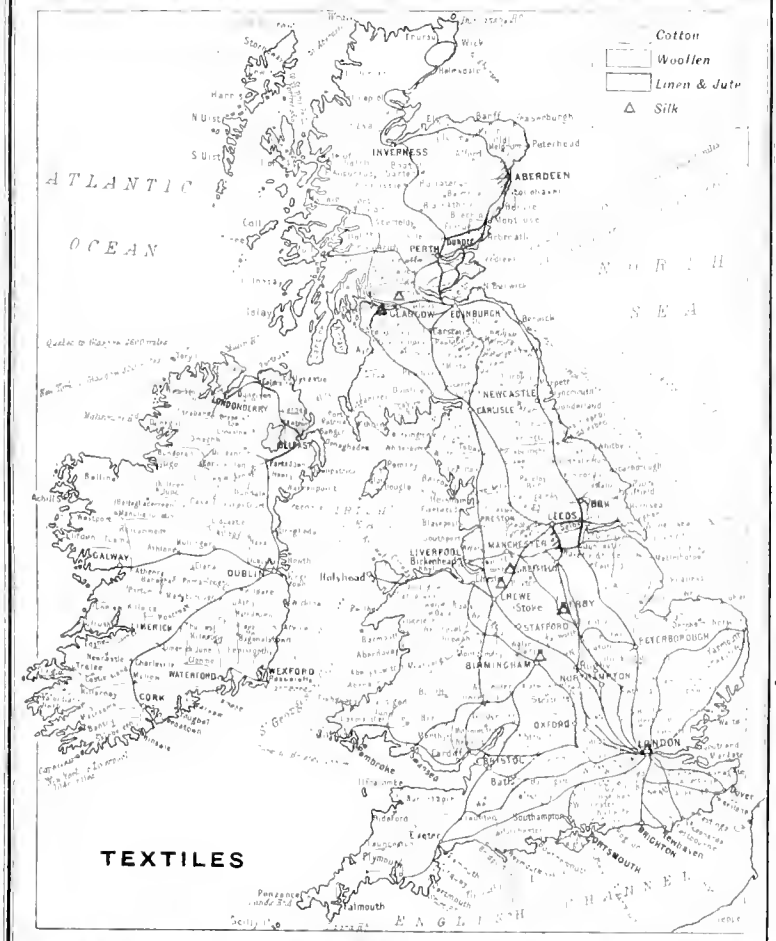


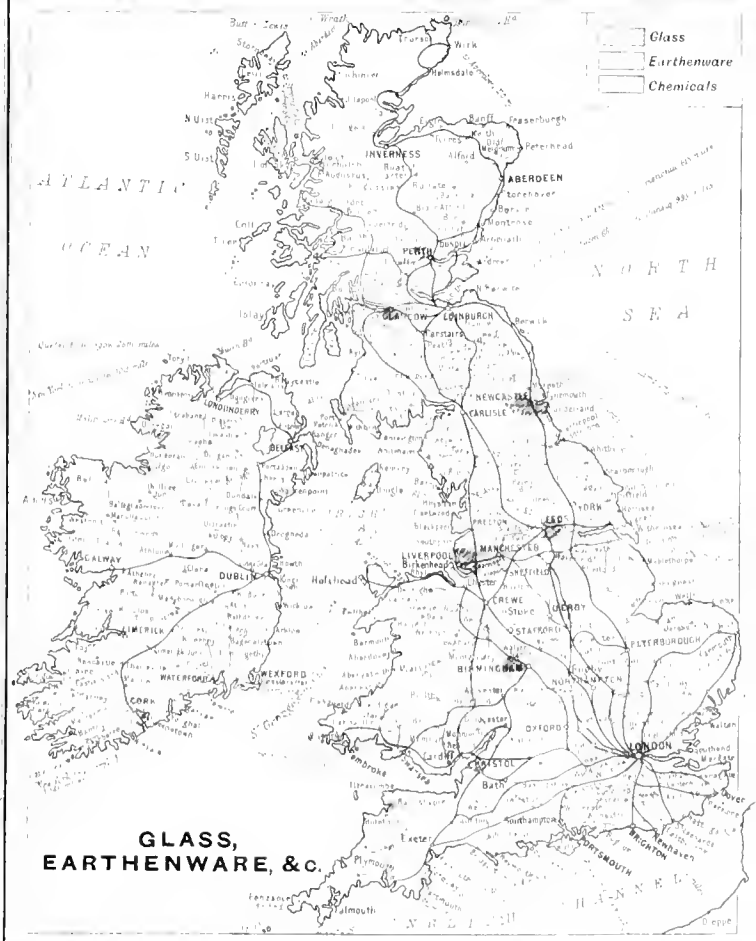
English Miles
0 50 100 150 200 250

BRITISH ISLES–DENSITY OF POPULATION, 1911.

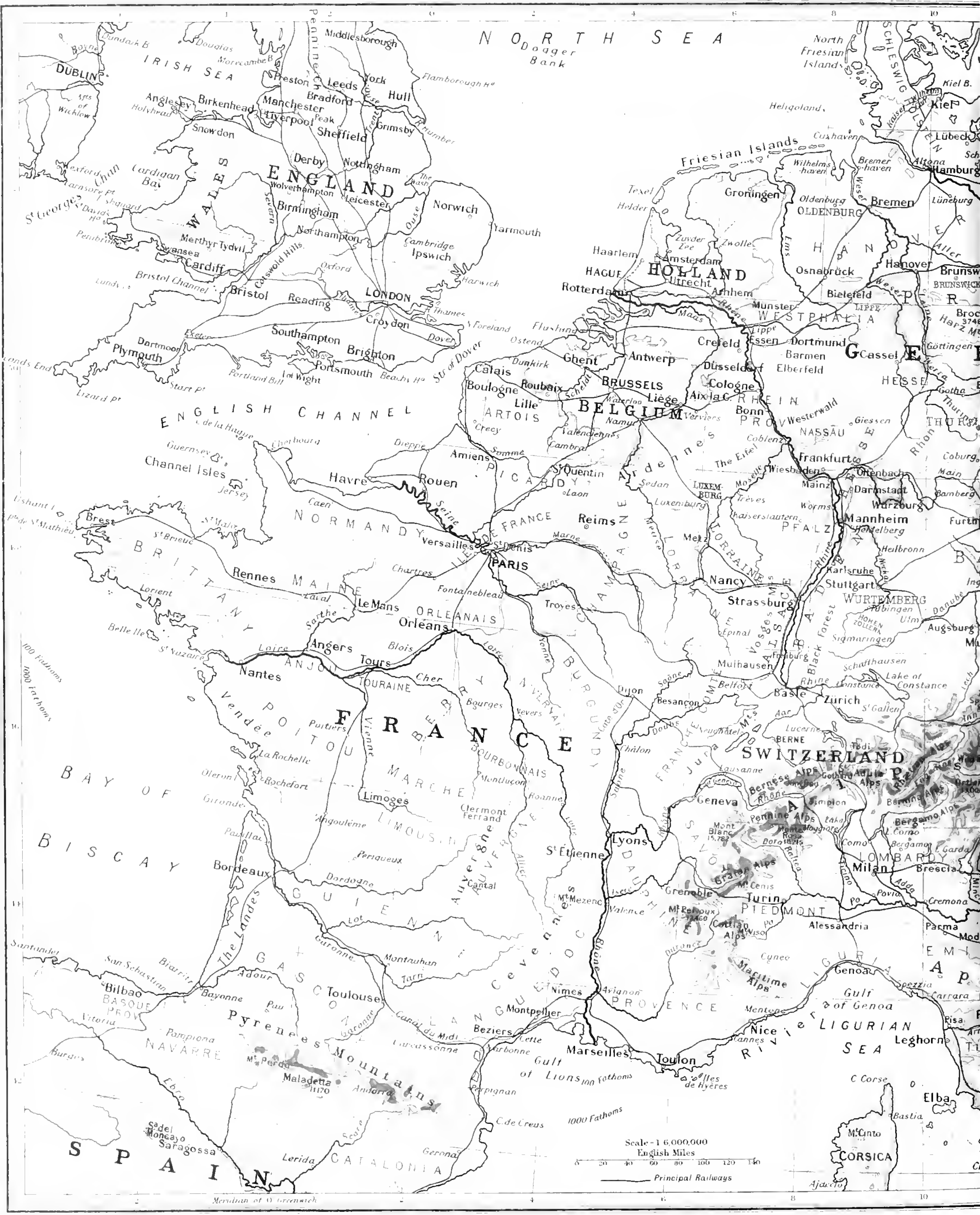


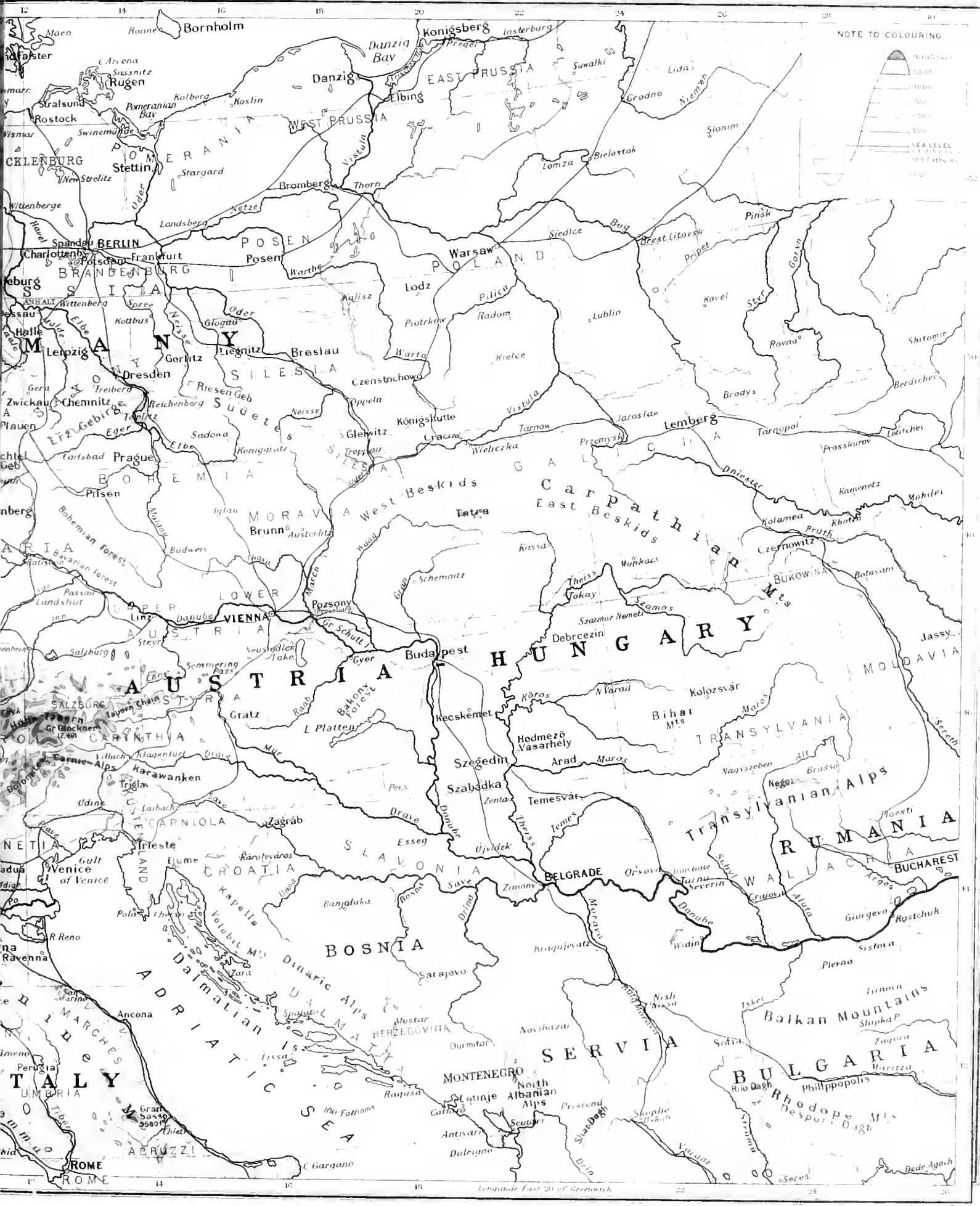


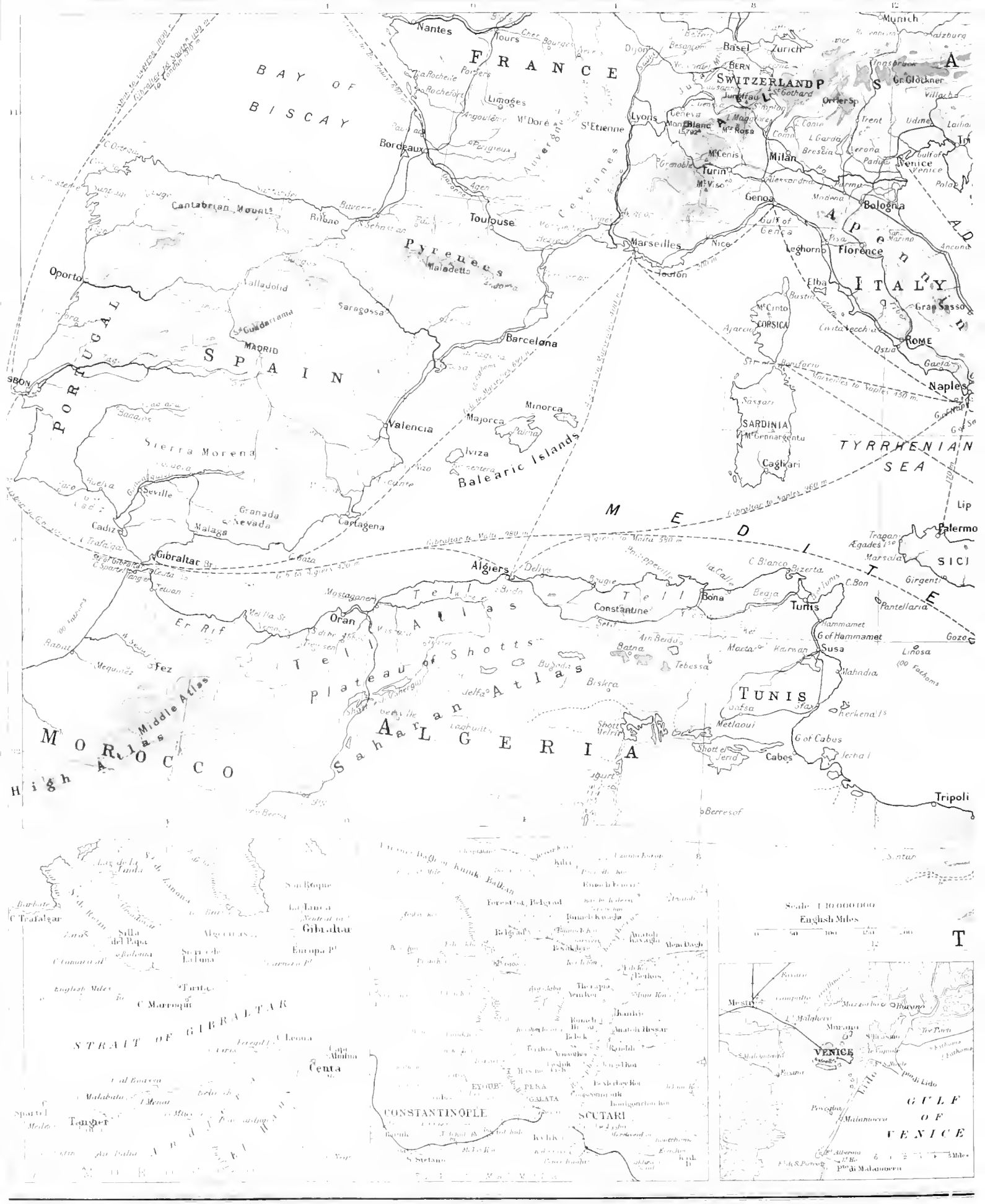


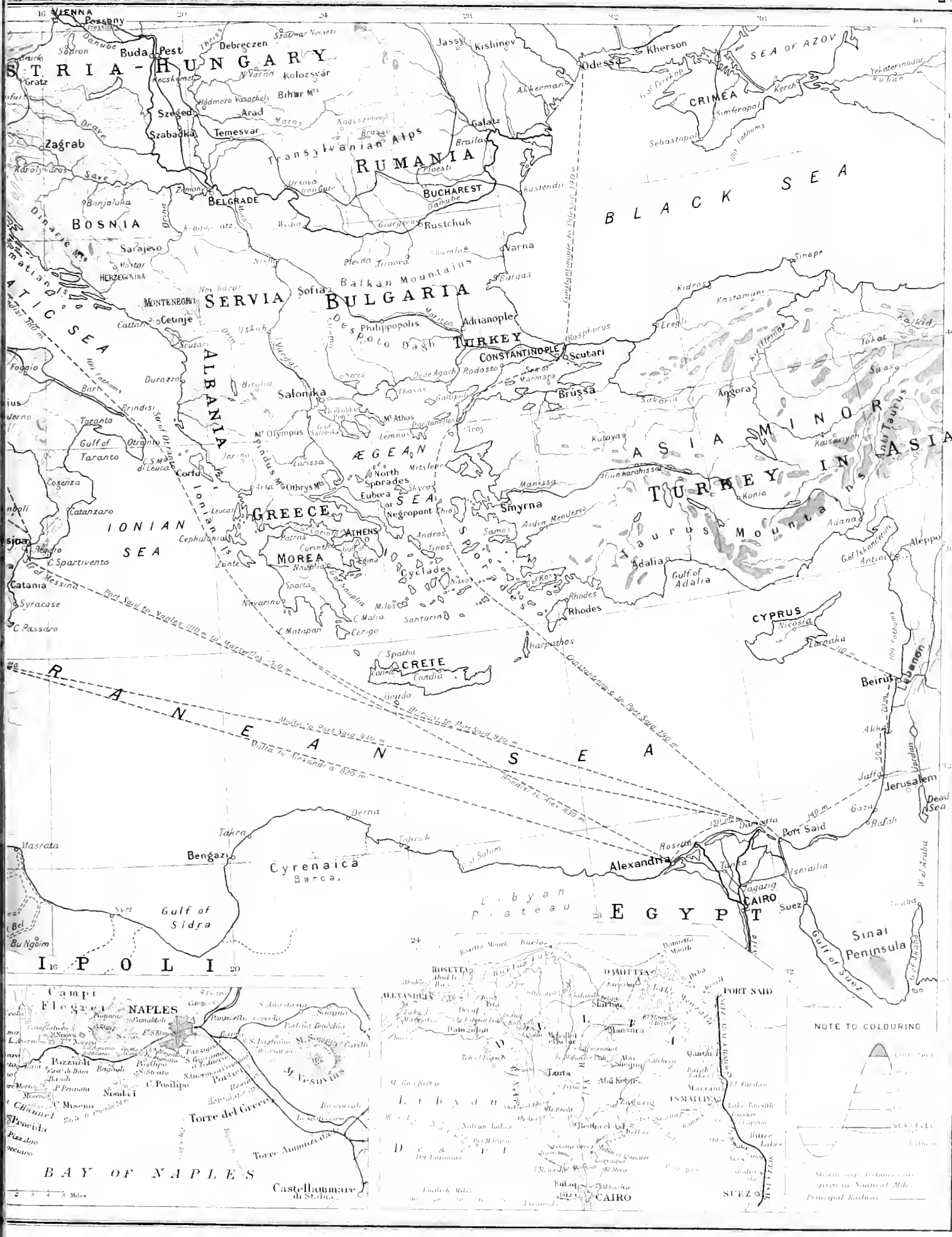


English Miles
0 50 100 150 200 250

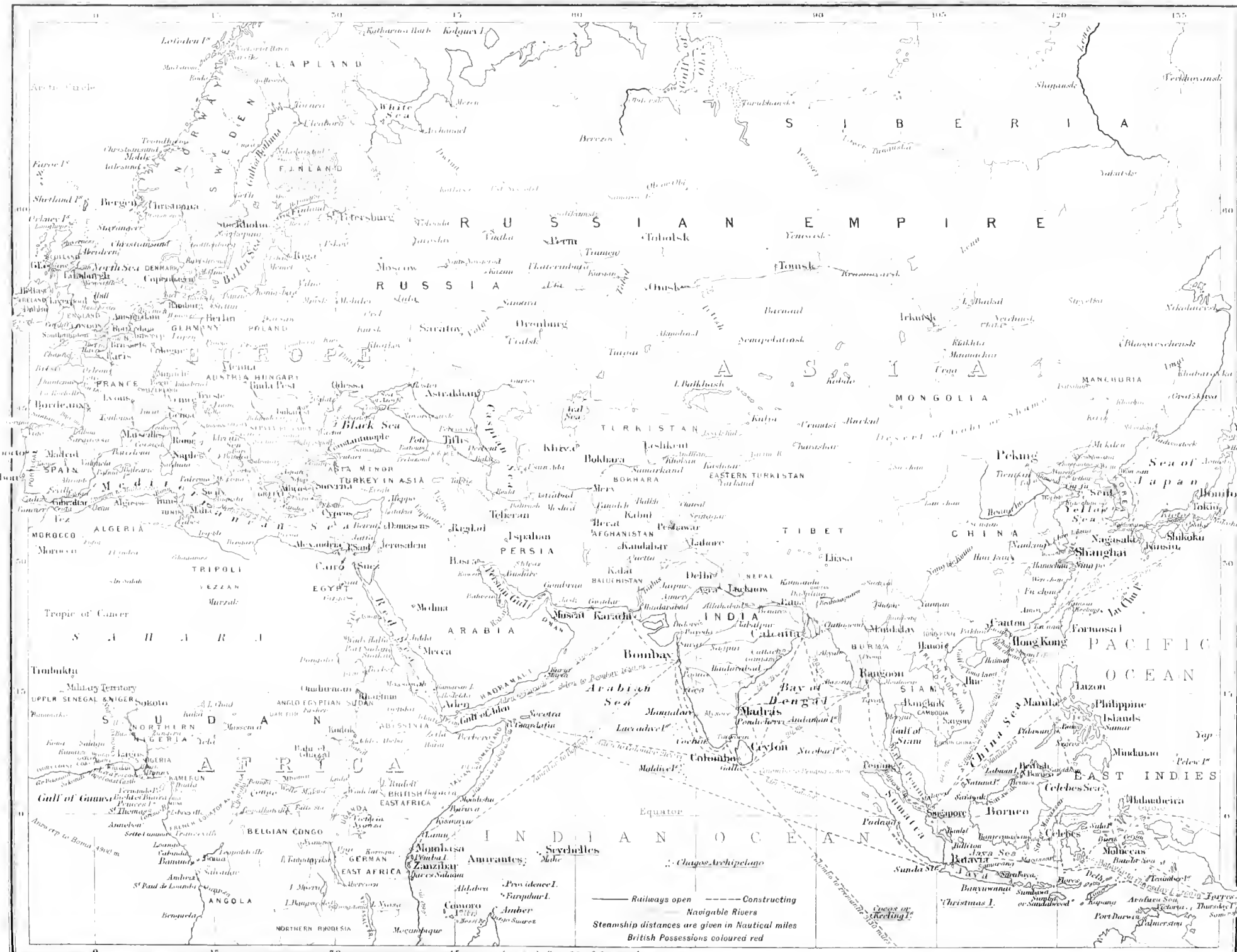

NORTH SEA
Dogger Bank
IRISH SEA
DUBLIN
ENGLAND
WALES
LONDON
Liverpool
Manchester
Leeds
York
Hull
Sheffield
Birmingham
Bristol
Cardiff
Plymouth
Southampton
Brighton
Portsmouth
Norwich
Yarmouth
ENGLISH CHANNEL
Channel Isles
HOLLAND
Amsterdam
Rotterdam
HAGUE
Friesian Islands
BELGIUM
BRUSSELS
Antwerp
Ghent
Liège
Hamburg
Bremen
Hanover
Kiel
Cologne
Frankfurt
Mannheim
Strassburg
FRANCE
PARIS
Versailles
Havre
Rouen
Reims
Nancy
Rennes
Brest
Nantes
Orléans
Tours
Angers
Limoges
Bordeaux
Toulouse
Lyons
St Etienne
Marseilles
Toulon
Nice
Montpellier
Nimes
BAY OF BISCAY
Gulf of Lions
SWITZERLAND
Geneva
Zürich
Basle
BERNE
Turin
Milan
Genoa
LIGURIAN SEA
CORSICA
SPAIN
Bilbao
Saragossa
Pyrenees Mountains
Scale - 1:6,000,000
English Miles
Principal Railways


NOTE TO COLOURING
SEA LEVEL
Bornholm
Königsberg
Danzig
Danzig Bay
EAST PRUSSIA
WEST PRUSSIA
POMERANIA
Rügen
Stralsund
Rostock
Stettin
Pomeranian Bay
Kolberg
Koslin
Elbing
Grodno
Lida
Suwalki
Niemen
Slonim
Bromberg
Thorn
Vistula
Bielostok
Lomza
Pinsk
Siedlce
Brest Litovsk
Pripet
Bug
Warsaw
POLAND
POSEN
Posen
BRANDENBURG
BERLIN
Spandau
Charlottenburg
Potsdam
Frankfurt
Landsberg
Netze
Warthe
Lodz
Kalisz
Piotrkow
Radom
Lublin
Kielce
Pilica
Kovel
Styr
Rovno
Shitomir
Berdichev
Brodys
Lemberg
Tarnopol
Tarnow
Jaroslav
Przemysl
Prosskurov
Leutschev
Cracow
Wieliczka
Vistula
GALICIA
Carpathian Mts
West Beskids
East Beskids
Tatra
Kamenetz
Mohilev
Kolomea
Khotin
Pruth
Czernowitz
BUKOWINA
Botosani
Jassy
MOLDAVIA
Dniester
Königshütte
Gleiwitz
Tropplau
Oppeln
Czenstochowa
Sadowa
Königgrätz
Elbe
Eger
Neisse
Oder
Glogau
Liegnitz
Breslau
Gorlitz
Dresden
Riesen Geb
Sudetes
SILESIA
Saxony
Leipzig
Halle
Wittenberg
Kottbus
Spree
Elbe
ANHALT
Freiberg
Chemnitz
Zwickau
Reichenberg
Teplitz
Erz Gebirge
Carlsbad
Prague
BOHEMIA
Pilsen
Brunn
Austerlitz
MORAVIA
Iglau
Budweis
Moldau
Bohemian forest
Bavarian forest
Passau
Landshut
Linz
Danube
VIENNA
Pozsony
Gr Schuttl I
Marchfeld
March
Waag
Gran
Schemnitz
Krassó
Theiss
Munkacs
Tokay
Szamos
Szamar Nemeti
Debrecezin
Hungarian Plain
HUNGARY
Budapest
Gyor
Raab
Bakony forest
L Platten
Kecskémet
Köros
N Varad
Kolozsvár
Bihar Mts
Maros
TRANSYLVANIA
Hodmezö Vasarhely
Szegedin
Arad
Maros
Szabadka
Zenta
Temesvár
Temes
Transylvanian Alps
Negoi
Brassó
Nagyszeben
Alt
Szreth
Moesti
RUMANIA
BUCHAREST
Argeș
Craiova
Aluta
Turnu Severin
Orsova
Iron gate
Schyl
WALLACHIA
Giurgevo
Rustchuk
Danube
Widin
Sistova
Plevna
Tirnova
Balkan Mountains
Shipka P
Tarjorn
Maritza
Philippopolis
Rilo Dagh
Rhodope Mts
Despot Dagh
BULGARIA
Sofia
Nish
Nissa
Morava
Kragujevatz
Novibazar
Sarajevo
Mostar
HERZEGOVINA
Durmitor
MONTENEGRO
SERVIA
BOSNIA
Banjaluka
Bosna
Drina
Save
Zimony
BELGRADE
Esseg
Ujvidek
Theiss
Temes
Danube
Drave
Zagrab
SLAVONIA
CROATIA
Karolyváros
Fiume
Trieste
Gulf of Venice
Venice
Udine
Laibach
Save
Triglav
Karawanken
Villach
Klagenfurt
Drave
Carnic Alps
Gr Glockner
12,461
Tauern Chain
Hallein
Tyrol
SALZBURG
CARINTHIA
STYRIA
Gratz
Mur
Semmering Pass
Eros
Neusiedler Lake
Steyr
Salzburg
Inn
Danube
Linz
AUSTRIA
UPPER
LOWER
Ancona
Loreto
Perugia
UMBRIA
MARCHES
ITALY
Gran Sasso
9580ft
Chieti
ABRUZZI
ROME
Tiber
Rapallo
Genoa
Spezia
Leghorn
Pisa
Florence
Arno
Apennines
Ravenna
R Reno
Po
Dalmatian Is
Dinaric Alps
Velebit Mts
Kapella
ADRIATIC SEA
100 Fathoms
Ragusa
Cattaro
Antivari
Scutari
North Albanian Alps
Prisrend
Shar Dagh
Shophe
Drin
Vardar
Seres
Dede Agach
Rio Dagh
Longitude East of Greenwich

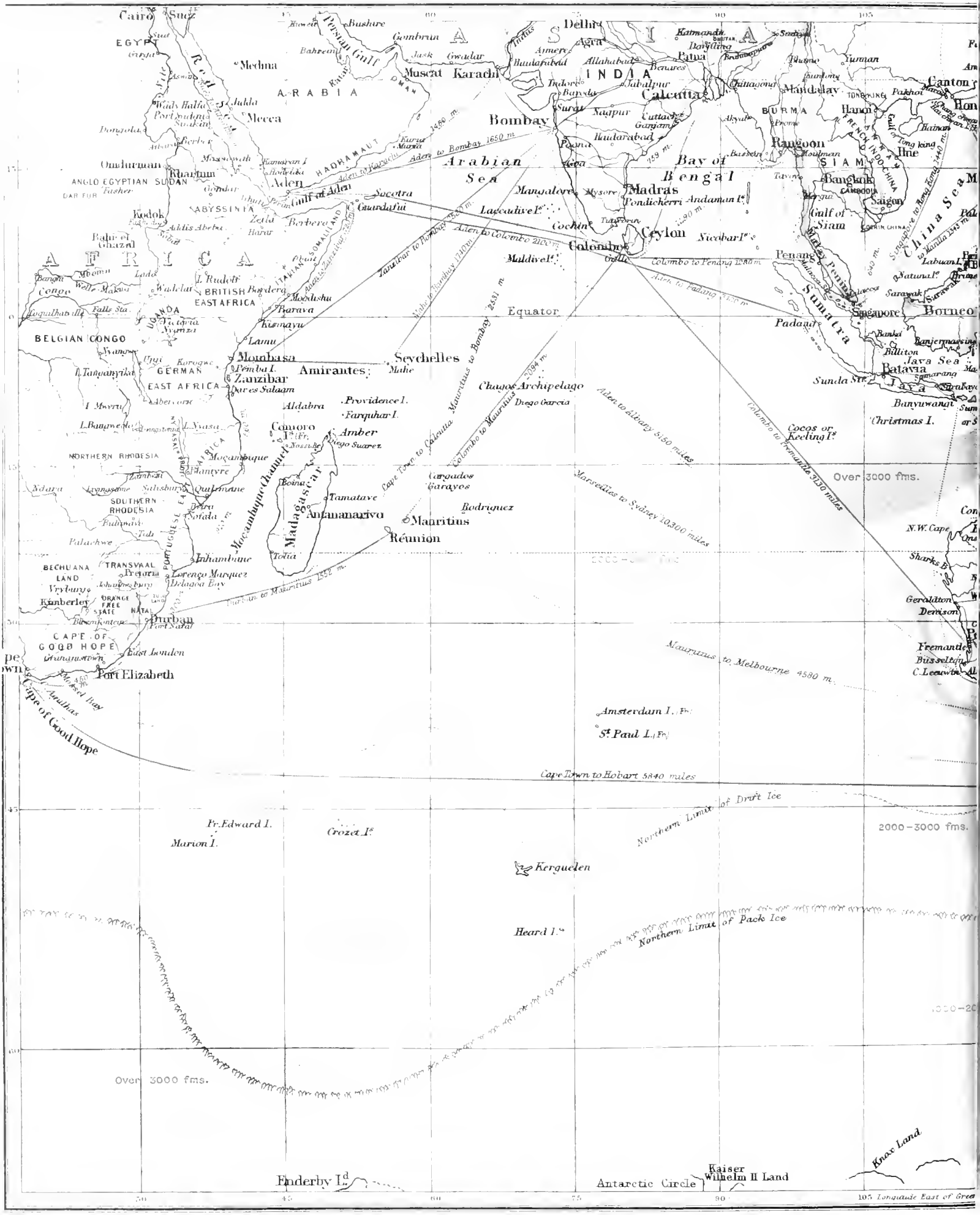

FRANCE
BAY OF BISCAY
SPAIN
PORTUGAL
SWITZERLAND
ITALY
Nantes
Tours
Bordeaux
Toulouse
Marseilles
Nice
Lyons
Geneva
Basel
Zurich
Munich
Milan
Turin
Genoa
Bologna
Florence
Venice
Naples
Rome
Pyrenees
Cantabrian Mounts
Oporto
Lisbon
Valladolid
Saragossa
MADRID
Barcelona
Valencia
Minorca
Majorca
Iviza
Balearic Islands
Sierra Morena
Seville
Granada
Cadiz
Malaga
Cartagena
Gibraltar
Algiers
Oran
Tunis
Bona
Constantine
Bougie
Tell Atlas
Er Rif
Fez
Mequinez
Middle Atlas
High Atlas
MOROCCO
ALGERIA
Sahara
Plateau of Shotts
Jelfa
Biskra
Susa
Mahadia
Sfax
Gabes
Tripoli
TUNIS
Corsica
Sardinia
Cagliari
Palermo
Sicily
TYRRHENIAN SEA
MEDITERRANEAN
Lisbon to Gibraltar 300 m.
Gibraltar to Malta 980 m.
Gibraltar to Algiers 420 m.
Gibraltar to Naples 960 m.
Marseilles to Naples 450 m.
Malta to Alexandria 1320 m.
Scale 1:10,000,000
English Miles
C Trafalgar
Gibraltar
C Marroquin
STRAIT OF GIBRALTAR
Tangier
Ceuta
Tarifa
CONSTANTINOPLE
SCUTARI
GALATA
PERA
EYOUB
VENICE
GULF OF VENICE
Lido
Malamocco
Chioggia

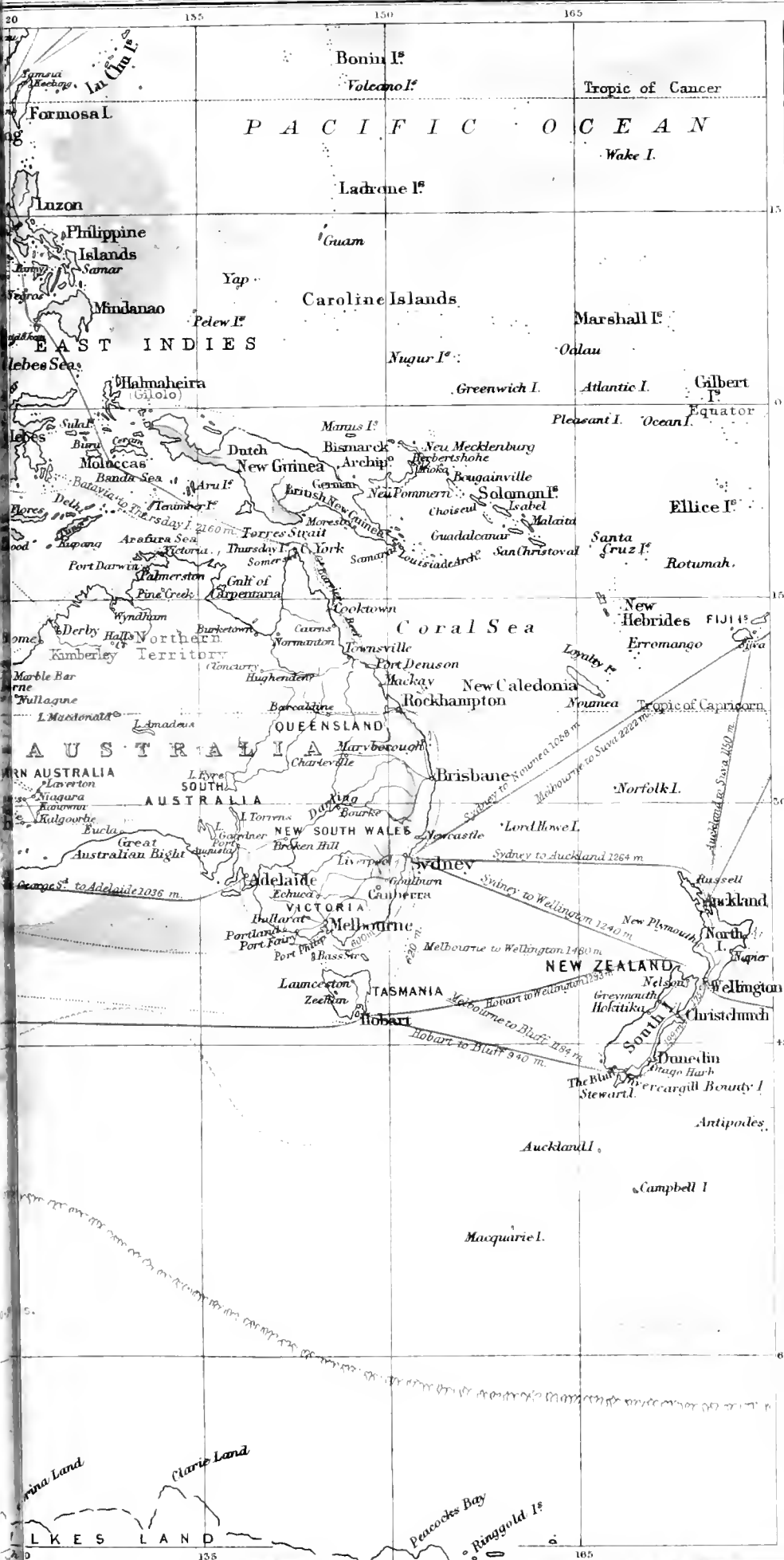

AUSTRIA-HUNGARY
VIENNA
Pressburg
Buda
Pest
Debreczen
Kecskemet
Szeged
Arad
Temesvar
Szabadka
Zagrab
Gratz
Drave
Save
Danube
Transylvanian Alps
RUMANIA
BUCHAREST
Galatz
Braila
Ploesti
Jassy
Kishinev
Odessa
Kherson
SEA OF AZOV
CRIMEA
Kertch
Simferopol
Sebastopol
BLACK SEA
BELGRADE
Banjaluka
BOSNIA
Sarajevo
HERZEGOVINA
Dinaric Alps
MONTENEGRO
SERVIA
Cettinje
Scutari
ALBANIA
ADRIATIC SEA
Durazzo
Brindisi
Taranto
Gulf of Taranto
Otranto
Cosenza
Catanzaro
Corfu
IONIAN SEA
Cephalonia
Zante
Leucas
GREECE
ATHENS
Corinth
Patras
MOREA
Navarino
Sparta
Argos
Cape Matapan
Cape Spartivento
Reggio
Catania
Syracuse
C. Passaro
Strait of Messina
Sofia
Philippopolis
Adrianople
BULGARIA
Balkan Mountains
Plevna
Rustchuk
Varna
Burgas
Constantinople to Odessa 410 m.
TURKEY
CONSTANTINOPLE
Scutari
Bosphorus
Sea of Marmara
Brussa
Gallipoli
Dardanelles
Troy
Salonika
Mt Athos
Mt Olympus
Lemnos
Thasos
Mitylene
North Sporades
Eubœa or Negropont
Skyros
Thermopylæ
Othrys Mts
Pindus Mts
Larissa
Volo
Gulf of Salonika
Gulf of Volo
Gulf of Lepanto
ÆGEAN SEA
Smyrna
Manissa
Aidin
Menderes
Samos
Andros
Tinos
Cyclades
Naxos
Milos
Santorin
Cerigo
Cape Malea
Gulf of Nauplia
Gulf of Kolokythia
Rhodes
Cape Krio
Gulf of Kos
Kos
Patmos
Karpathos
Crete
Candia
Spatha
Goudo
Port Said to Naples 1110 m. to Marseilles 1540 m.
Gibraltar to Port Said 2290 m.
Malta to Port Said 940 m.
Malta to Alexandria 820 m.
Gibraltar to Suez 2830 m.
MEDITERRANEAN SEA
Derna
Tobruk
Bengazi
Cyrenaica
Barca
Gulf of Sidra
Syrt
Bu Ngoim
Misrata
Libyan Plateau
EGYPT
Alexandria
Roseta
Damietta
Port Said
Tanta
Ismailia
CAIRO
Suez
Gulf of Suez
Sinai Peninsula
Wel Araba
Dead Sea
Jordan
Jaffa
Jerusalem
Gazu
Rafah
Akka
Beirut
Lebanon
Aleppo
Gof Iskanderun
Antioche
Adana
Adalia
Gulf of Adalia
Taurus Mountains
TURKEY IN ASIA
ASIA MINOR
Anti Taurus
Konia
Kutayas
Afiun Karahissar
Sakaria
Angora
Kastamuni
Kidros
Sinope
Kalkid
Tokat
Siwas
Kaiseriyeh
Ereg
Kutchuk Hamak
Ipsala
Dede Agach
Rodosto
Sea of Marmara
Varna
Kustendji
Danube
Constantinople to Odessa 410 m.
Cyprus
Nicosia
Larnaka
Naples
Campi Flegrei
Pozzuoli
Nisida
C. Posilipo
Torre del Greco
M. Vesuvius
Torre Annunziata
Castellammare di Stabia
BAY OF NAPLES
Rosetta
Damietta
Alexandria
Port Said
Suez
Cairo
Lake Menzaleh
Lake Mareotis
Lake Timsah
Lake Bitter
Ismailia
Tanta
Abu Kebir
Zagazig
Mansura
Damietta
Delta
Libyan Desert
Arabian Desert
NOTE TO COLOURING
SEA LEVEL

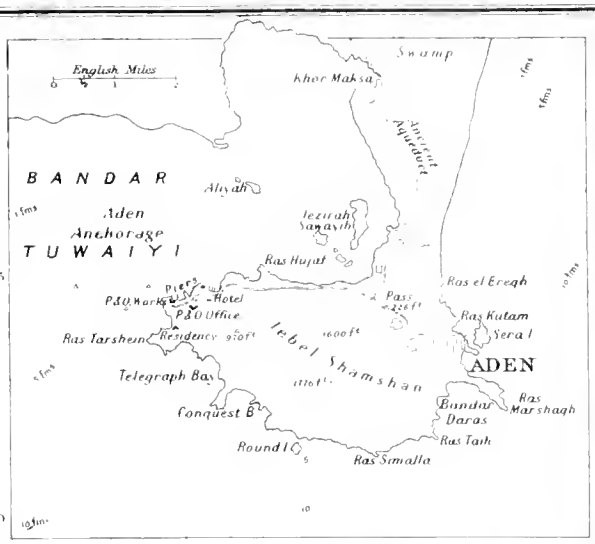
TRADE ROUTES BETWEEN EUROPE AND ASIA

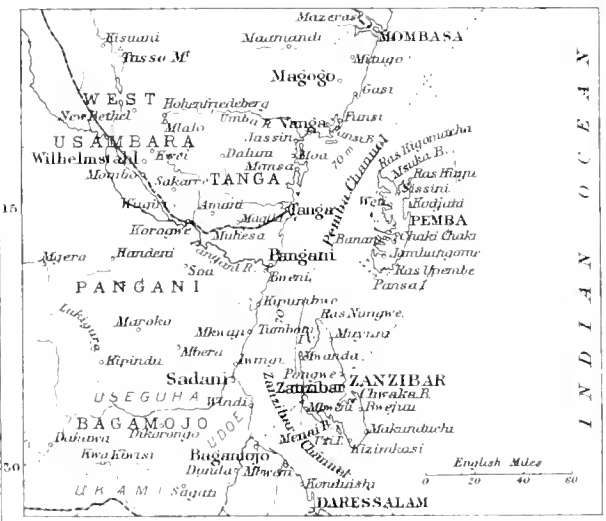


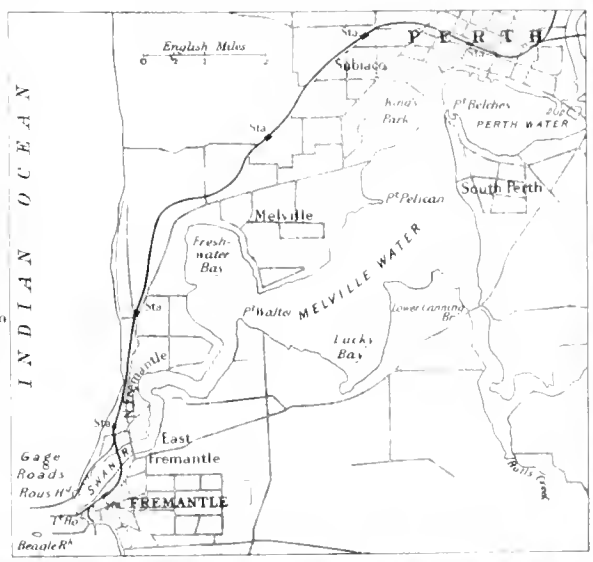
ANCIENT TRADE ROUTES


Cairo
Suez
EGYPT
Red Sea
Persian Gulf
Bushire
Gambrun
Jask
Gwadar
Muscat
Karachi
Mecca
Jidda
Medina
ARABIA
Arabian Sea
Bombay
INDIA
Delhi
Agra
Allahabad
Benares
Patna
Calcutta
Jabalpur
Nagpur
Surat
Poona
Hyderabad
Madras
Pondicherri
Andaman Is
Laccadive Is
Mangalore
Cochin
Ceylon
Colombo
Maldive Is
Nicobar Is
Bay of Bengal
BURMA
Rangoon
Mandelay
Canton
Hanoi
Bangkok
SIAM
Saigon
Gulf of Siam
China Sea
Penang
Singapore
Sumatra
Borneo
Padang
Batavia
Java
Java Sea
Sunda Str.
Banjermassing
Banyuwangi
Christmas I.
Cocos or Keeling Is
Aden
Omdurman
Khartum
ANGLO EGYPTIAN SUDAN
Gulf of Aden
HADHRAMAUT
Socotra
Guardafui
ABYSSINIA
Addis Abeba
Harar
Zeila
Berbera
ITALIAN SOMALILAND
Kodok
Bahr el Ghazal
AFRICA
BRITISH EAST AFRICA
UGANDA
Mombasa
Pemba I.
Zanzibar
Amirantes
Seychelles
Mahe
Aldabra
Providence I.
Farquhar I.
Chagos Archipelago
Diego Garcia
Comoro Is
Amber
Diego Suarez
Equator
BELGIAN CONGO
GERMAN EAST AFRICA
Dar es Salaam
Lamu
Kismayu
Brava
Moshi
Tanga
Victoria Nyanza
Albertnyanza
L. Rudolf
L. Tanganyika
L. Mweru
L. Bangweolo
L. Nyasa
NORTHERN RHODESIA
SOUTHERN RHODESIA
Mozambique Channel
Madagascar
Tamatave
Antananarivo
Majunga
Mauritius
Réunion
Rodriguez
Cargados Garayos
Mozambique
Beira
Quilimane
Inhambane
Lorenzo Marquez
Delagoa Bay
PORTUGUESE E. AFRICA
BECHUANA LAND
TRANSVAAL
Pretoria
Johannesburg
Kimberley
ORANGE FREE STATE
NATAL
Durban
Port Natal
CAPE OF GOOD HOPE
East London
Port Elizabeth
Cape of Good Hope
Agulhas
Mossel Bay
Cape Town to Calcutta 5300 m.
Mauritius to Bombay 2531 m.
Colombo to Mauritius 2094 m.
Aden to Bombay 1650 m.
Aden to Colombo 2100 m.
Aden to Albany 5150 miles
Colombo to Fremantle 3130 miles
Marseilles to Sydney 10300 miles
Mauritius to Melbourne 4580 m.
Cape Town to Hobart 5840 miles
Durban to Mauritius 1552 m.
Over 3000 fms.
2000–3000 fms.
Northern Limit of Drift Ice
Northern Limit of Pack Ice
Amsterdam I.
St. Paul I.
Fr. Edward I.
Marion I.
Crozet Is
Kerguelen
Heard I.
Enderby Id
Kaiser Wilhelm II Land
Knox Land
Antarctic Circle
Limits of Ocean Drainage Area
Deserts
Forests
Principal Steams



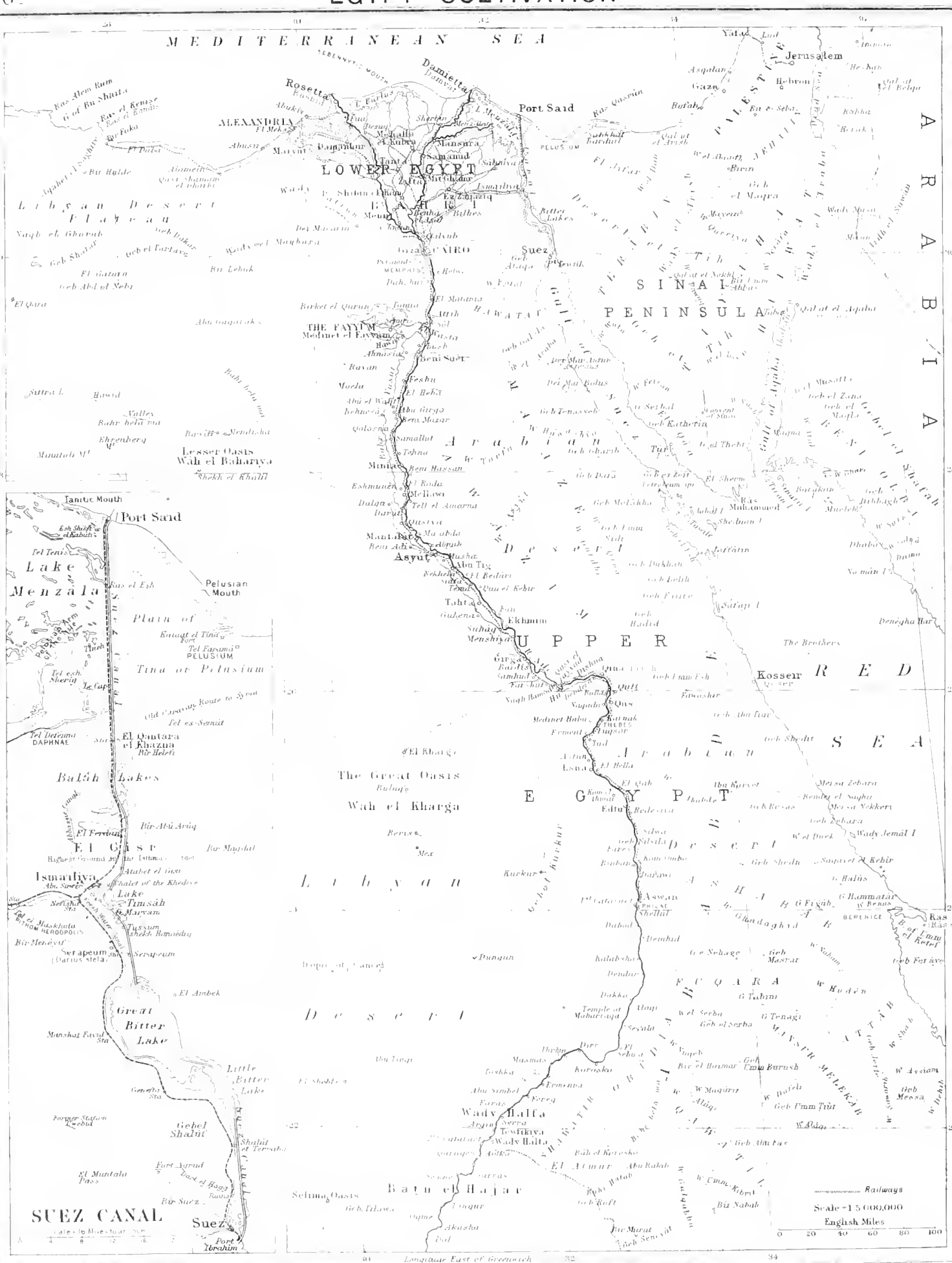






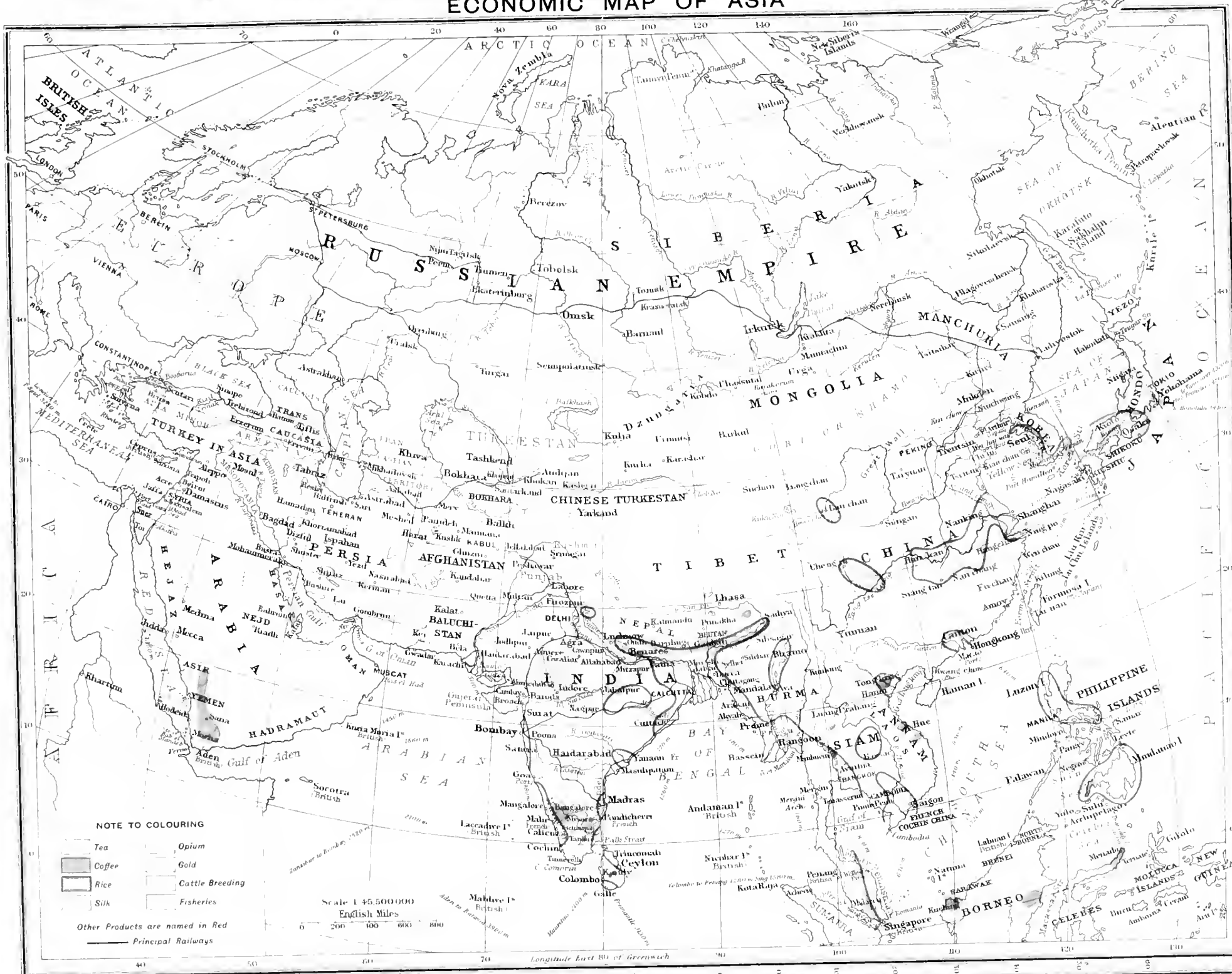
Ocean Depth Contours are drawn at intervals of 100, 1000, 2000, 3000 Fathoms

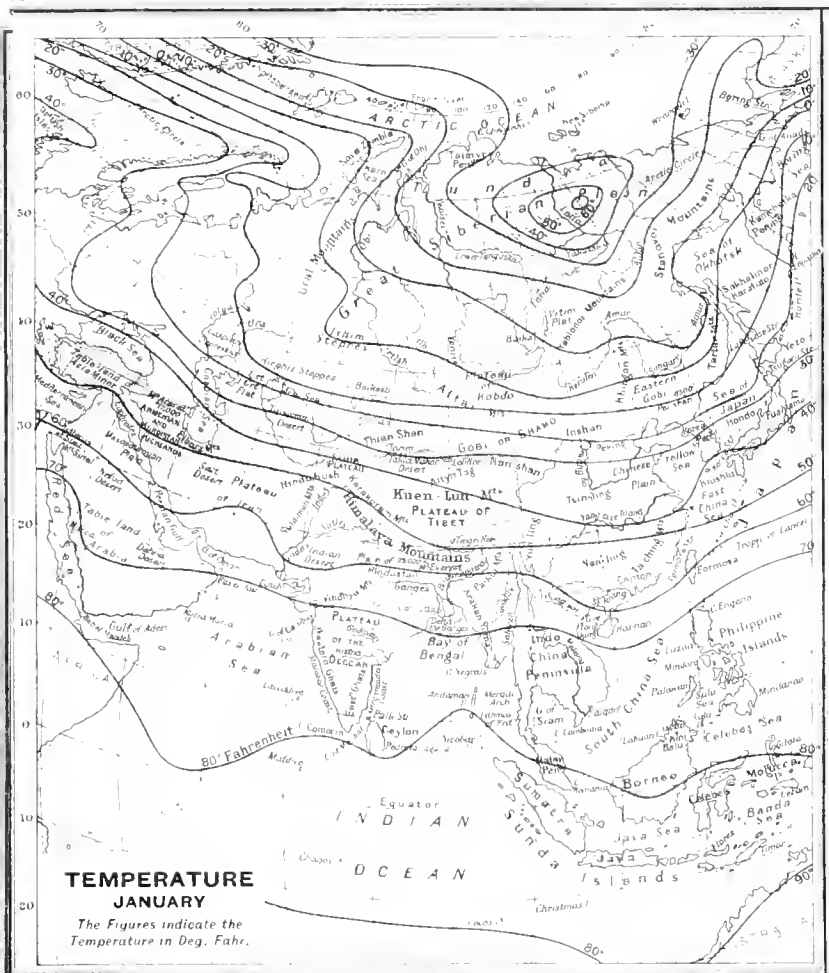
EGYPT—CULTIVATION

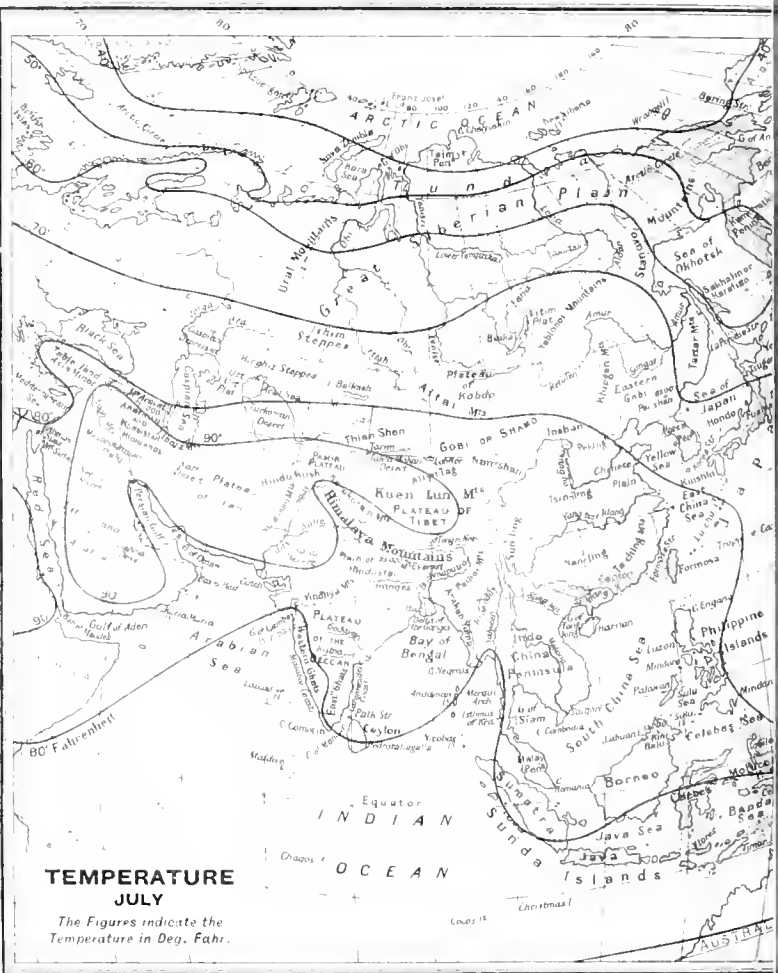


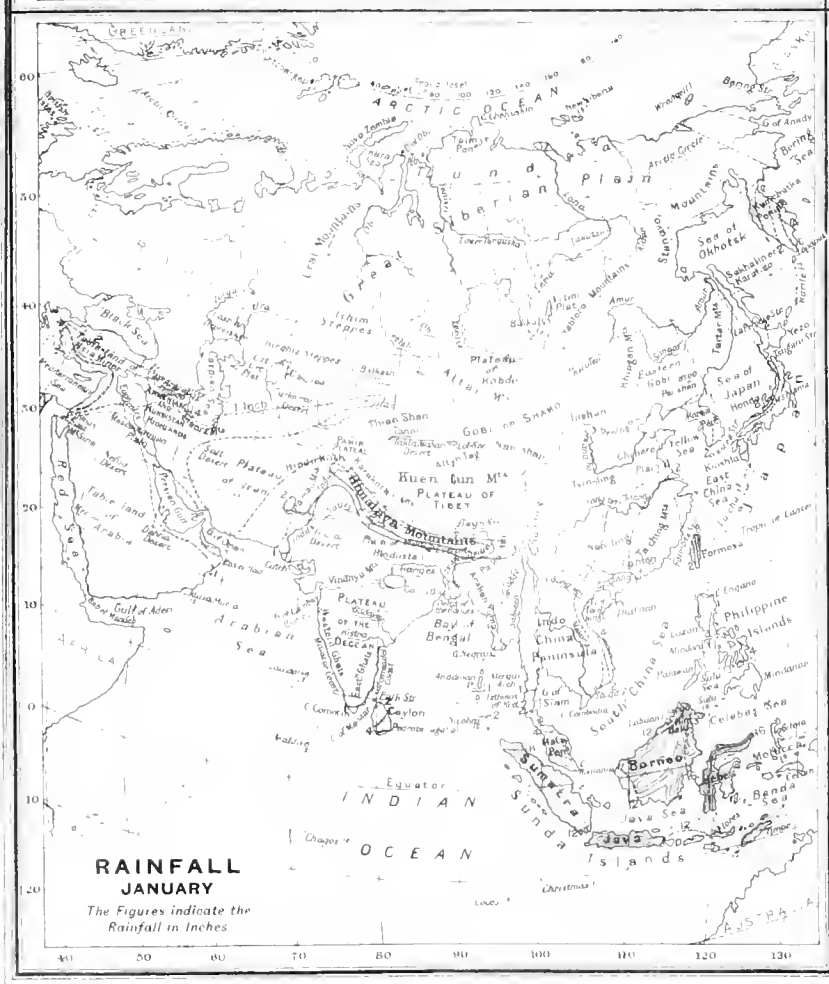
John Bartholomew & Co

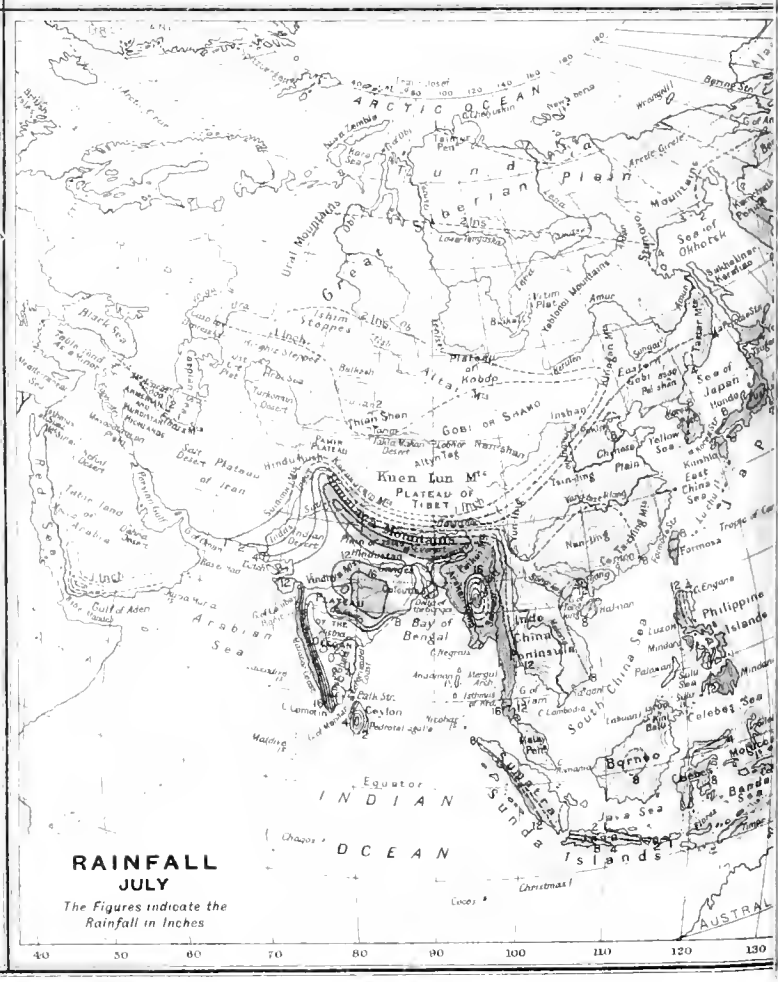
ECONOMIC MAP OF ASIA





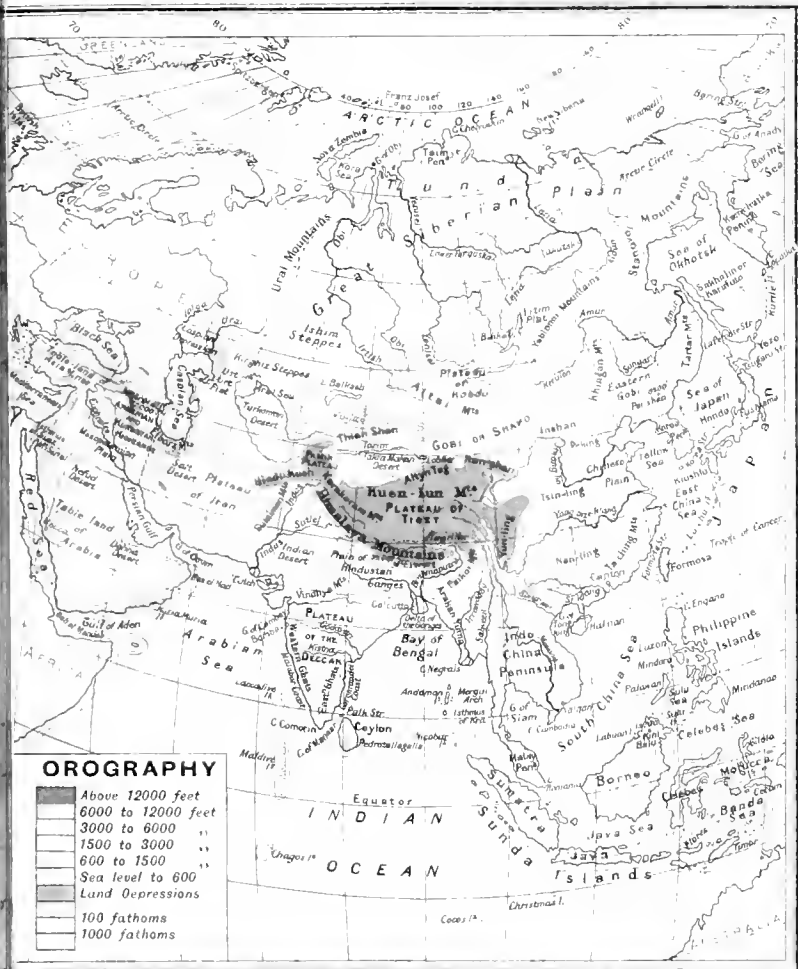


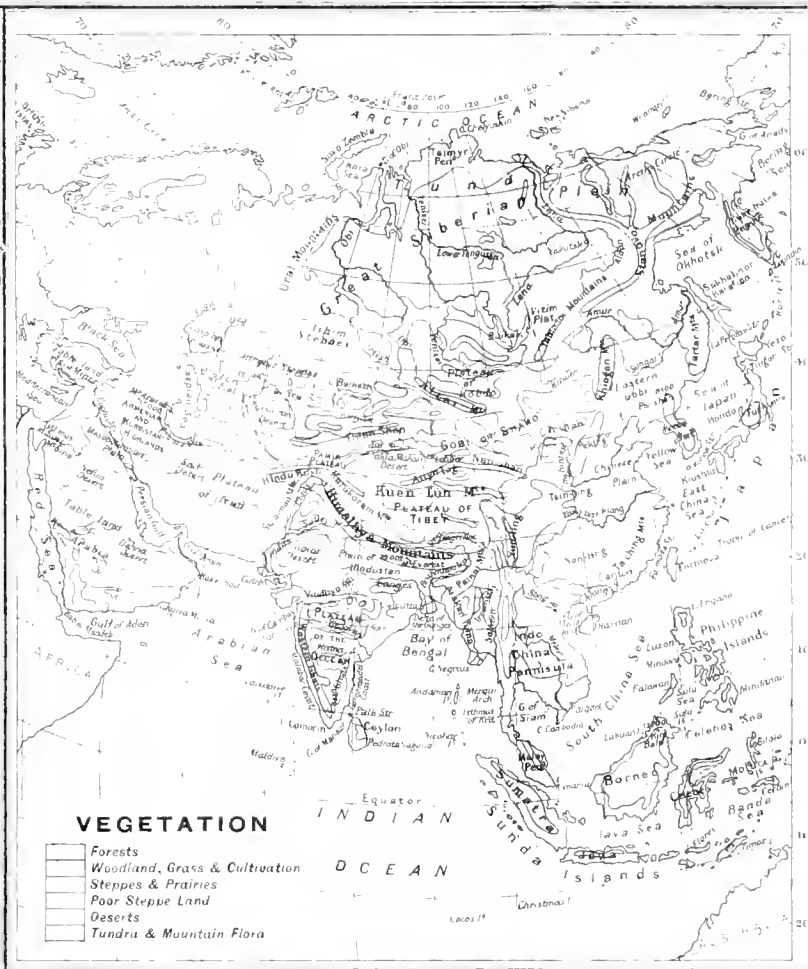


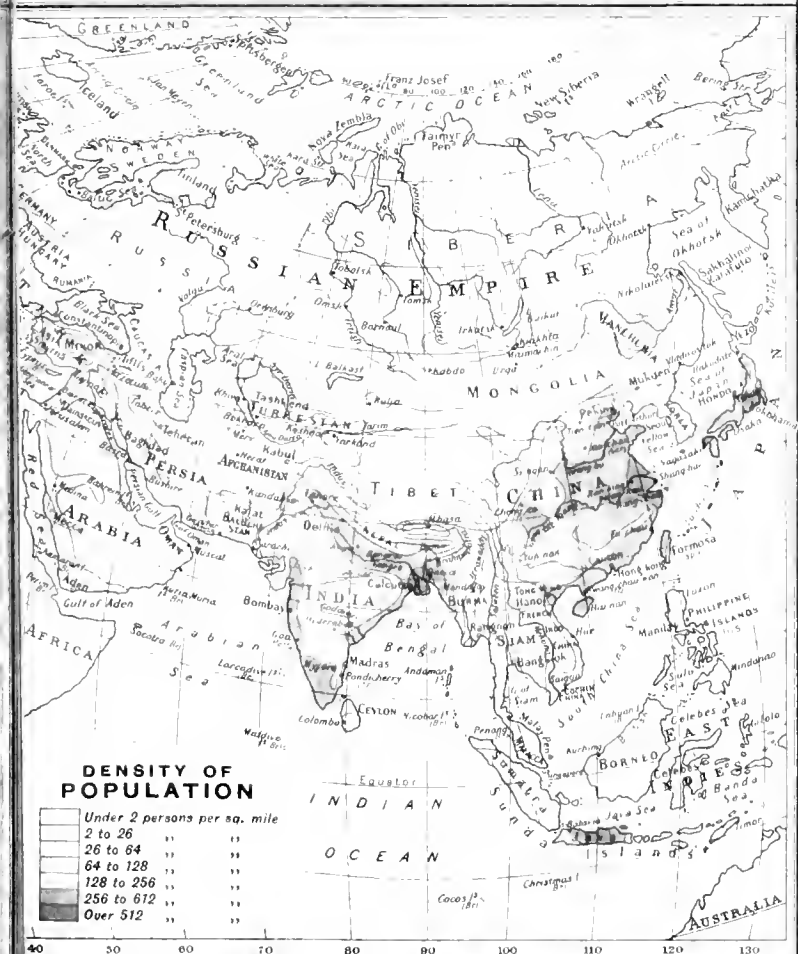


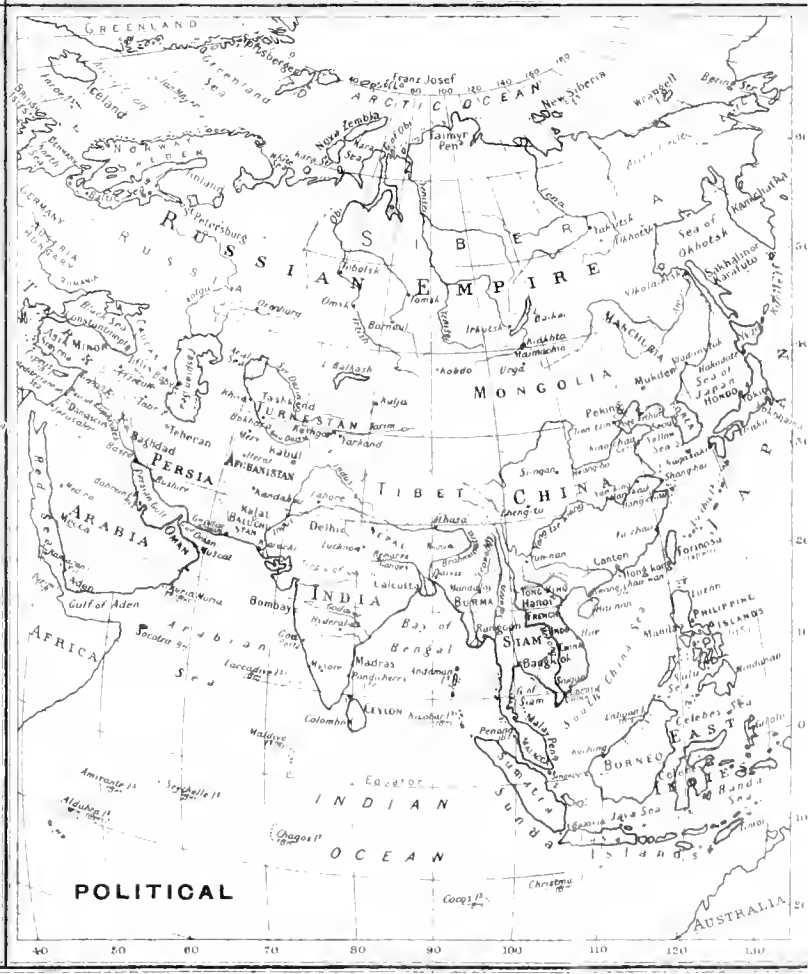
The Edinburgh Geographical Institute

English Miles
0 500 1000



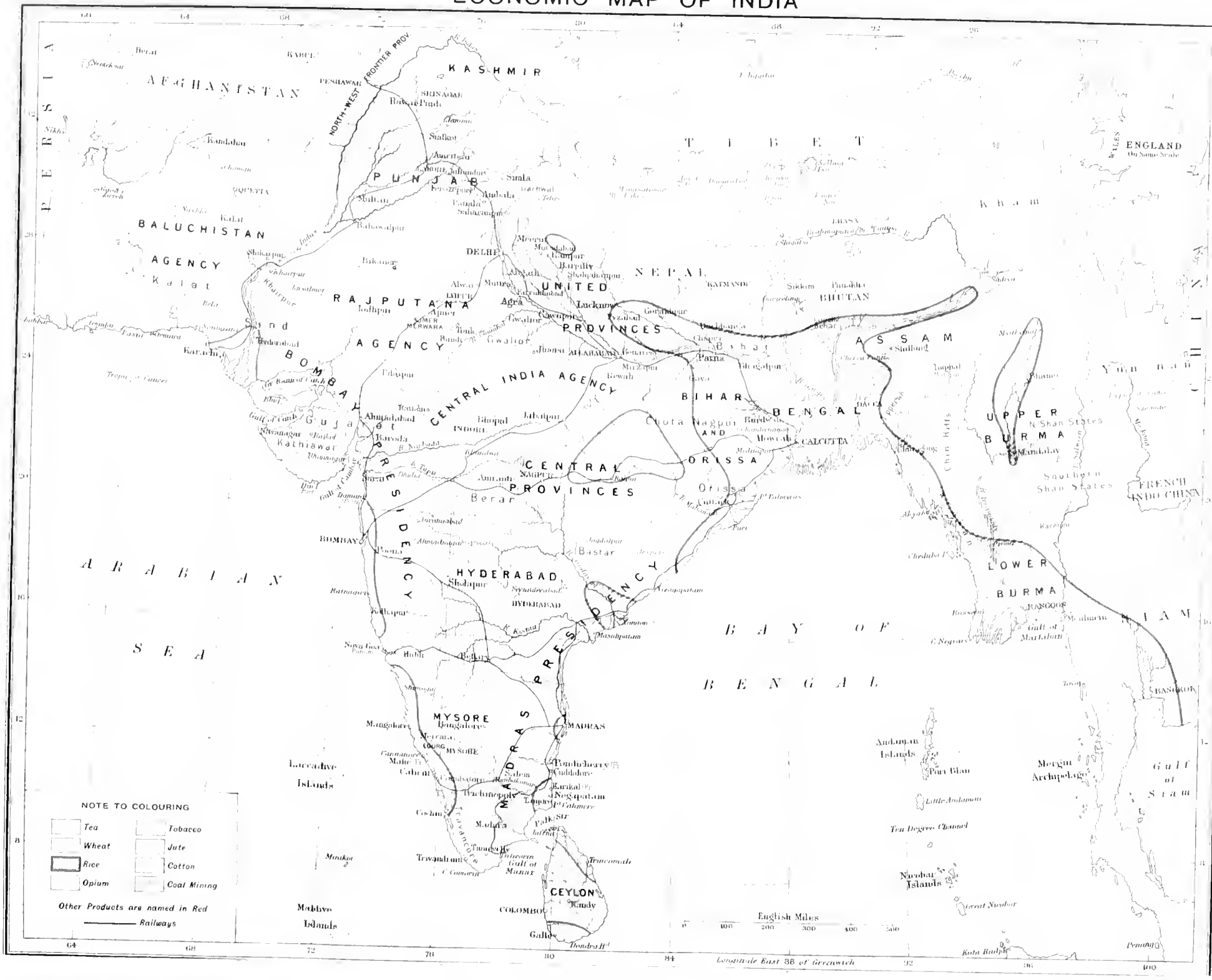


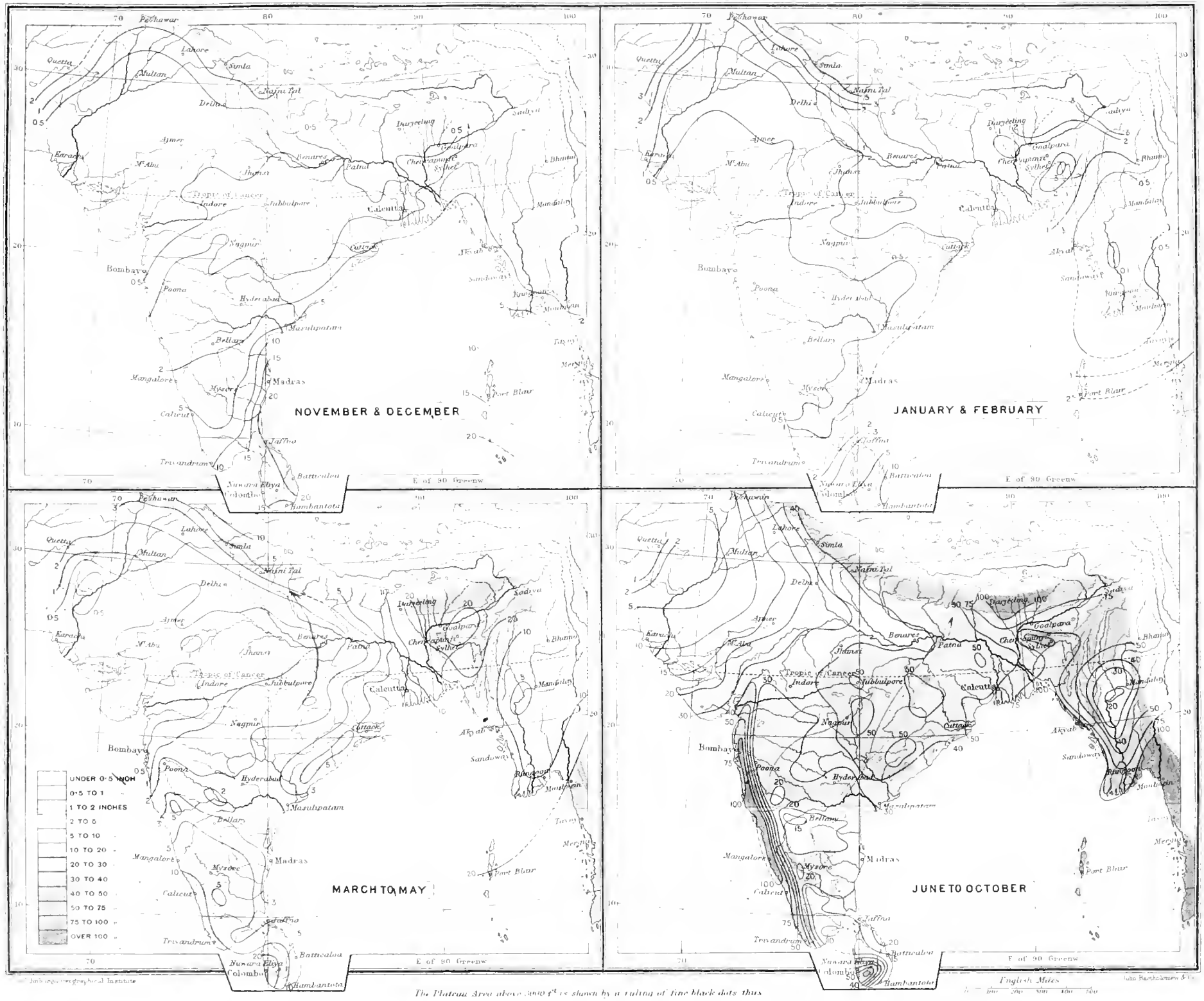




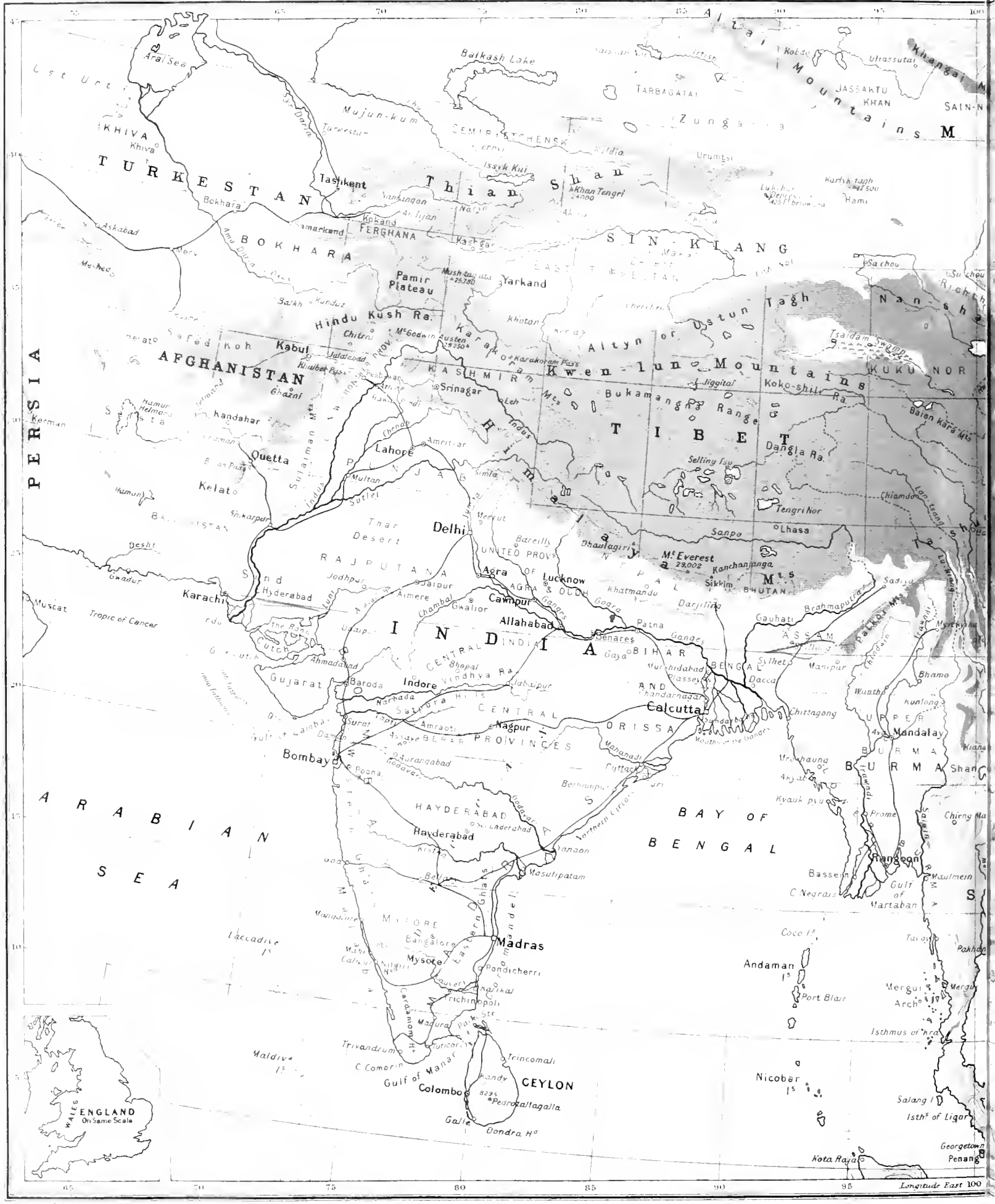
English Miles
0 500 1000

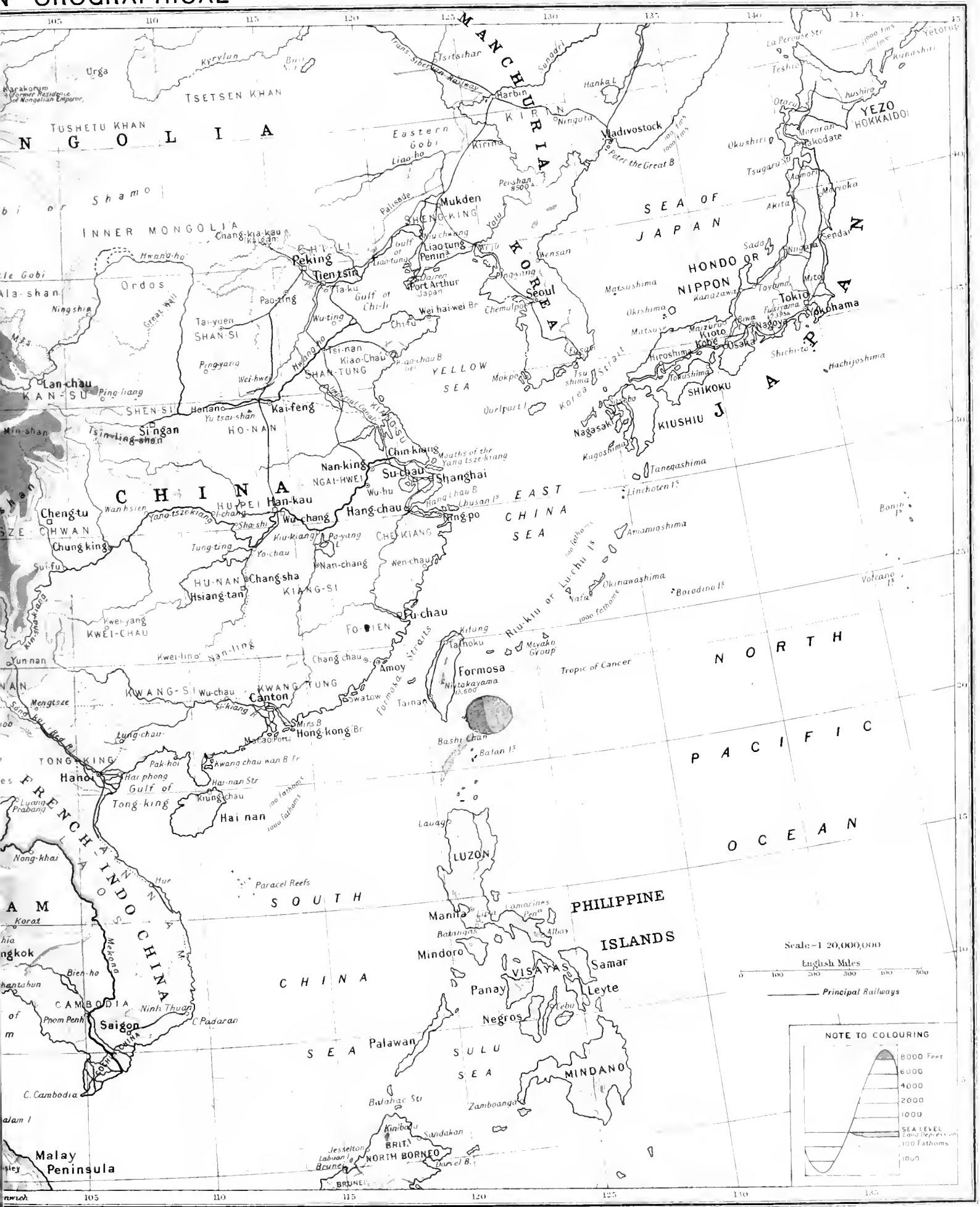
ECONOMIC MAP OF INDIA



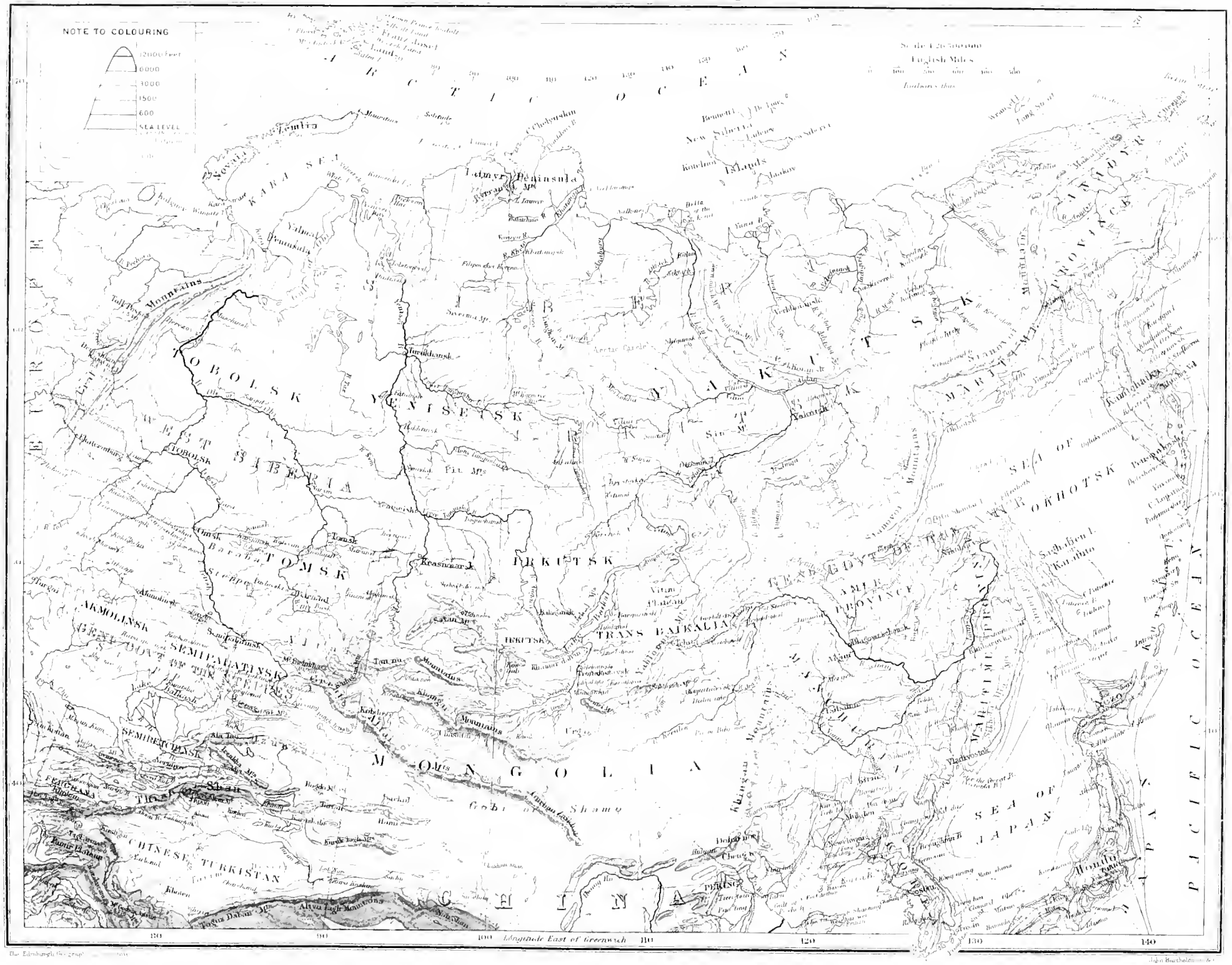


The Plateau Area above 3000 ft is shown by a tinting of fine black dots thus

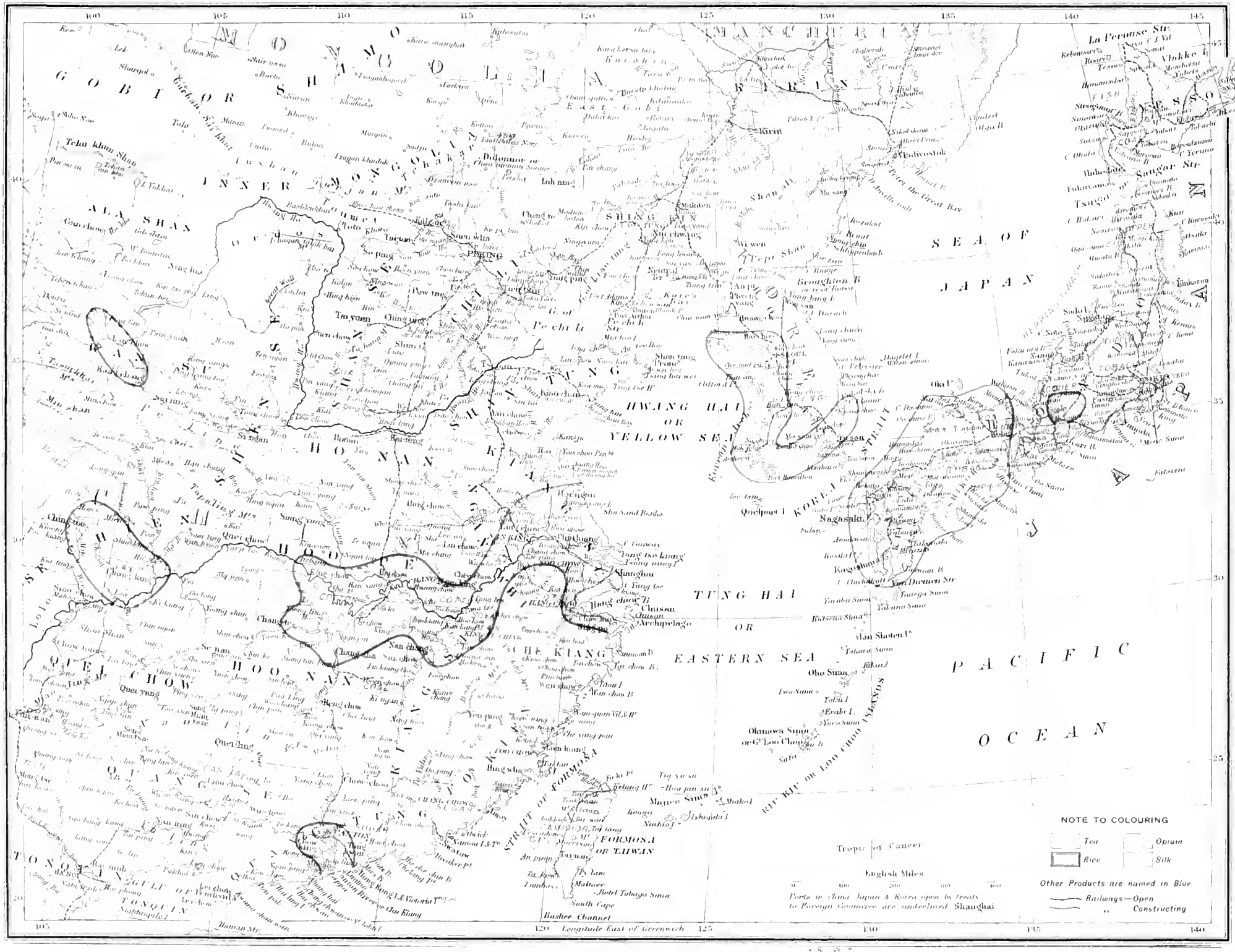

Aral Sea
Balkash Lake
Altai Mountains
Khangai Mts
TURKESTAN
KHIVA
Khiva
Tashkent
Bokhara
Samarkand
FERGHANA
Kokand
Thian Shan
Issyk Kul
TARBAGATAI
JASSAKTU KHAN
Zungaria
SEMIRETCHENSK
Urumtsi
Hami
SIN-KIANG
BOKHARA
Pamir Plateau
Yarkand
Kashgar
Khotan
Hindu Kush Ra.
Karakoram Pass
Altyn or Ustun Tagh
Nan-shan
Kwen-lun Mountains
KUKU NOR
Koko-shili Ra
Bukamangra Range
TIBET
Dangla Ra.
Tengri Nor
Lhasa
Sanpo
Himalaya
Mt. Everest 29,002
Kanchanjanga
Mts
SIKKIM
BHUTAN
NEPAL
Darjiling
Brahmaputra
Gauhati
ASSAM
Sylhet
Manipur
Dacca
BENGAL
Calcutta
Chandarnagar
Murshidabad
Patna
Benares
Gaya
BIHAR
Allahabad
Cawnpur
Lucknow
AGRA & OUDH
UNITED PROVS
Bareilly
Meerut
Delhi
Simla
Amrit-sar
Lahore
PUNJAB
Multan
Sutlej
Indus
Thar Desert
RAJPUTANA
Jodhpur
Jaipur
Ajmere
Chambal
Gwalior
Ganges
Jumna
Khatmandu
Bhaulagiri
AFGHANISTAN
Kabul
Jalalabad
Khaibet Pass
Chitral
Peshawar
Ghazni
Kandahar
Quetta
Kelat
Sulaiman Mts
Safed Koh
Herat
Meshed
Merv
Askhabad
Amu Darya
Oxus
Kunduz
Balkh
Khyber Pass
Bolan Pass
Kurram
Chenab
Ravee
Sutlej
Indus
Hamun
Helmund
Seistan
Kerman
PERSIA
BALUCHISTAN
Sind
Karachi
Hyderabad
Gwadur
Desht
Muscat
Tropic of Cancer
Gulf of Cambay
Cutch
Gt. Rann
Ahmadabad
Gujarat
Baroda
Indore
Bhopal
Vindhya Ra
Narbada
Satpura Hills
Surat
Amraoti
Nagpur
CENTRAL PROVINCES
BERAR
CENTRAL INDIA
ORISSA
Mahanadi
Cuttack
Bombay
Poona
Aurangabad
Godavari
HAYDERABAD
Hyderabad
Krishna
Vizagapatam
Eastern Ghats
Western Ghats
MYSORE
Bangalore
Mysore
Madras
Pondicherri
Trichinopoli
Madura
Cardamom Hills
Trivandrum
C Comorin
Gulf of Manar
Laccadive Is
Maldive Is
Colombo
CEYLON
Trincomali
Pedro Flats
Galle
Dondra Hd
ARABIAN SEA
BAY OF BENGAL
Andaman Is
Port Blair
Nicobar Is
Coco Is
Rangoon
Bassein
Gulf of Martaban
C Negrais
Mandalay
Bhamo
Kuntong
Wuntho
Chittagong
Arakan Yoma
Irrawadi
Prome
Kyauk pyu
Akyab
BURMA
Shan
Chieng Mai
Salween
Tavoy
Mergui Archo
Isthmus of Kra
Pakhoi
Salang I
Isth[s] of Ligar
Georgetown
Penang
Kota Raya
ENGLAND
On Same Scale
WALES
Longitude East
65
70
75
80
85
90
95
100


MANCHURIA
KIRIN
TSETSEN KHAN
TUSHETU KHAN
INNER MONGOLIA
Eastern Gobi
Shamo
Urga
Karakorum
Former Residence of Mongolian Emperor
Kyrylun
Buir
Tsitsihar
Harbin
Sungari
Hankai L
Ninguta
Kirin
Liao-ho
Peishan 8500
Mukden
SHENG-KING
Yalu
Liao-tung Penin
Dairen
Port Arthur
Japan
Gulf of Liao-tung
Gulf of Chi-li
Wei-hai-wei Br
Chefu
Peking
Tien-tsin
Ta-ku
Pao-ting
Hwang-ho
Great Wall
Ordos
Ning-sha
Tai-yuen
SHAN-SI
Wu-ting
Tsi-nan
Kiao-Chau
Kiao-chau B
SHAN-TUNG
YELLOW SEA
Mokpo
Tsu shima Strait
Quelpart I
Korea Str
Nagasaki
KIUSHIU
Kagoshima
Tanegashima
Linchoten Is
Amamoshima
Okinawashima
Naha
Borodino Is
Volcano Is
Bonin Is
Hachijoshima
Shichi-to
SHIKOKU
Hiroshima
Kobe
Osaka
Nagoya
Tokio
Yokohama
Fusiyama 12,365
Mitoo
Toyama
Kanazawa
Matsuyama
Okishima
Matsushima
HONDO OR NIPPON
Sendai
Aomori
Akita
Morioka
Hakodate
Muroran
Otaru
Teshio
Kushiro
Kunashiri
Yetorup
YEZO HOKKAIDO
Okushiri
Tsugaru Str
La Perouse Str
Vladivostock
Peter the Great B
Wonsan
Fusan
Chemulpo
Seoul
Pingyang
KOREA
SEA OF JAPAN
Lan-chau
KAN-SU
Ping-liang
SHEN-SI
Si-ngan
Tsin-ling-shan
Min-shan
Yu tsai-shan
Henano
Kai-feng
HO-NAN
Wei-hwei
Ping-yang
Chin-kiang
Mouths of the Yang tsze-kiang
Nan-king
Su-chau
Shanghai
NGAI-HWEI
Wu-hu
Hang-chau
Hang-chau B
Chusan Is
Ning-po
EAST CHINA SEA
CHE-KIANG
HU-PEI
Han-kau
Wu-chang
Sha-shi
Yang-tsze-kiang
I-chang
Wan hsien
Cheng-tu
SZE-CHWAN
Chung-king
Suf-fu
Kiu-kiang
Po-yang L
Yo-chau
Tung-ting
Nan-chang
Wen-chau
HU-NAN
Chang-sha
Hsiang-tan
KIANG-SI
Fu-chau
FO-KIEN
Kwei-yang
KWEI-CHAU
Kwei-lin
Nan-ling
Yun-nan
Chang-chau
Amoy
Swatow
Formosa Straits
Kilung
Taihoku
Riu-kiu or Lu-chu Is
Miyako Group
Nagasaki
Formosa
Niitakayama 13,600
Tropic of Cancer
Tainan
NORTH PACIFIC OCEAN
KWANG-SI
Wu-chau
KWANG TUNG
Canton
Si-kiang
Mengtsze
Song-koi R
Lung-chau
Mirs B
Macao Port
Hong-kong Br
Bashi Chan
Balan Is
TONG-KING
Hanoi
Pak-hoi
Kwang chau wan B Fr
Hai phong
Gulf of Tong-king
Hai-nan Str
Kiung-chau
Hai nan
100 fathoms
1000 fathoms
Luang Prabang
FRENCH INDO CHINA
Nong-khai
Paracel Reefs
SOUTH CHINA SEA
Korat
Mekong
Bien-ho
CAMBODIA
Ninh Thuan
Phnom Penh
Saigon
C Padaran
C. Cambodia
Malay Peninsula
Luang Prabang
Lauag
LUZON
Manila
Lamarines Pen
Albay
Batangas
Mindoro
PHILIPPINE ISLANDS
VISAYAS
Samar
Leyte
Panay
Negros
Cebu
Palawan
SULU SEA
MINDANAO
Zamboanga
Basilan Str
Kinibalu
Sandakan
BRIT. NORTH BORNEO
Jesselton
Labuan I
Brunei
BRUNEI
Marcel B.
Scale = 1 20,000,000
English Miles
0 100 200 300 400 500
Principal Railways
NOTE TO COLOURING
8000 Feet
6000
4000
2000
1000
SEA LEVEL
Land Depression
100 Fathoms
1000

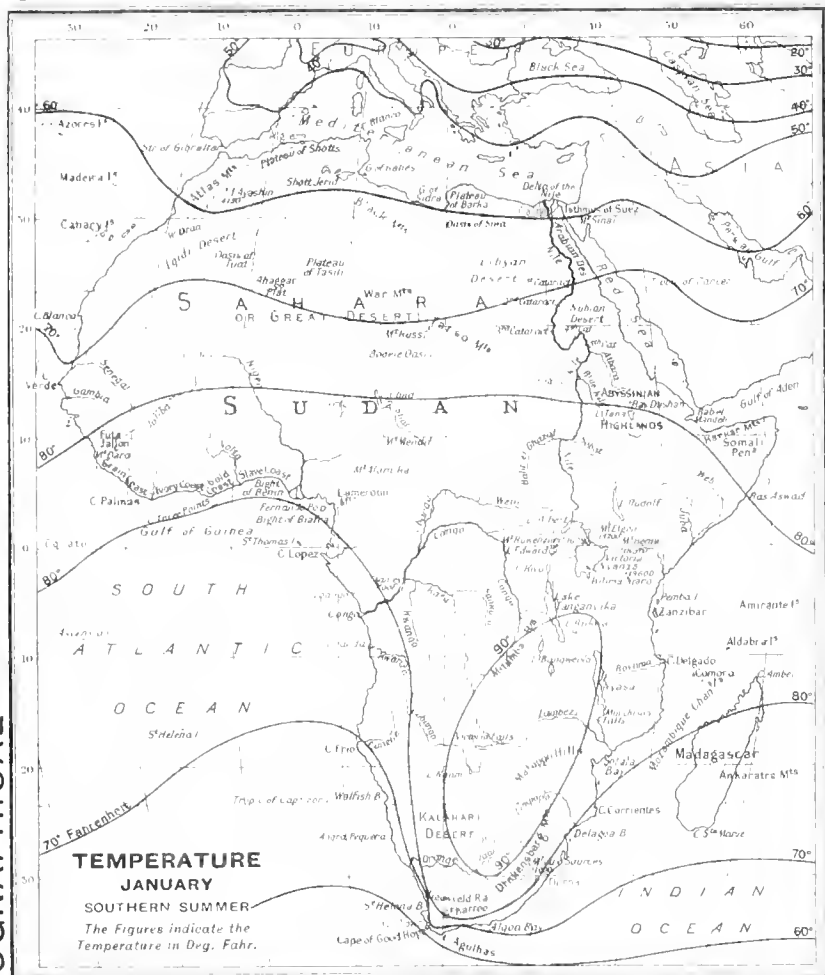
SIBERIA – OROGRAPHICAL

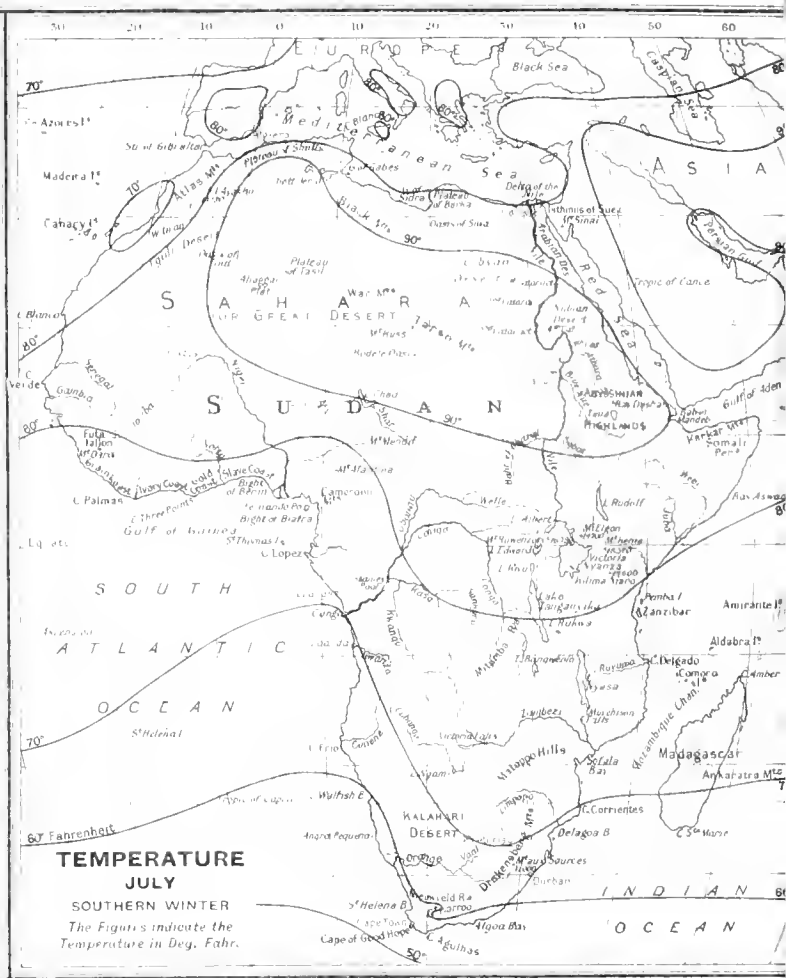


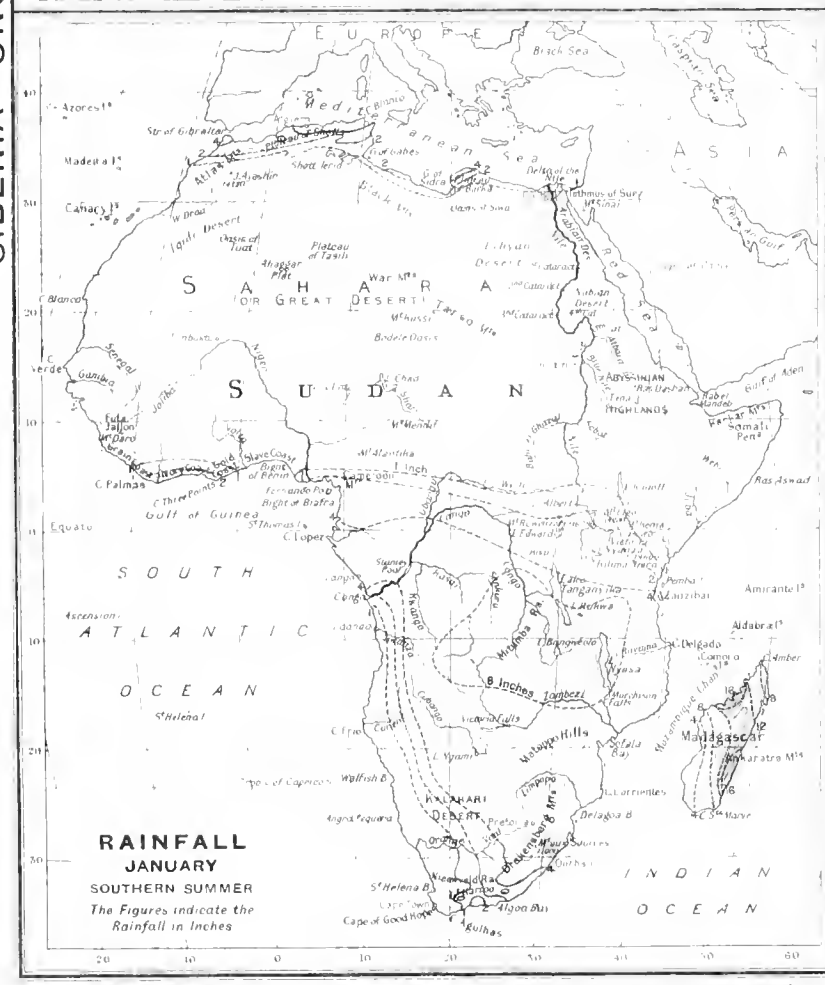
ECONOMIC MAP OF THE FAR EAST

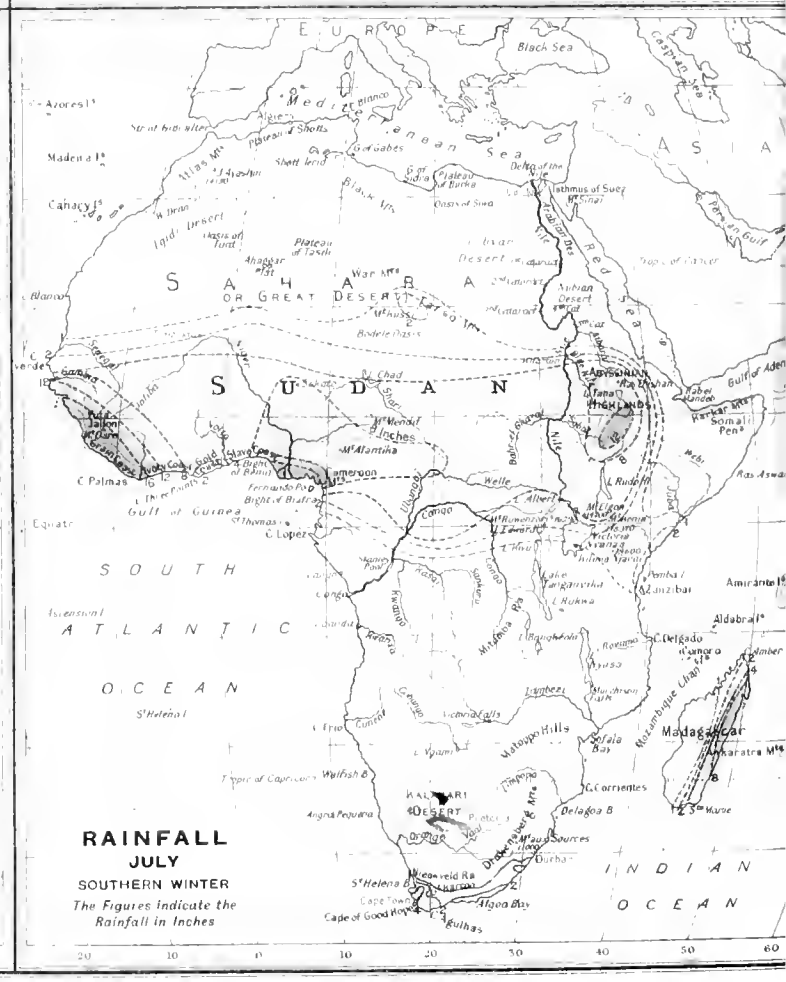


SIBERIA — OROGRAPHICAL



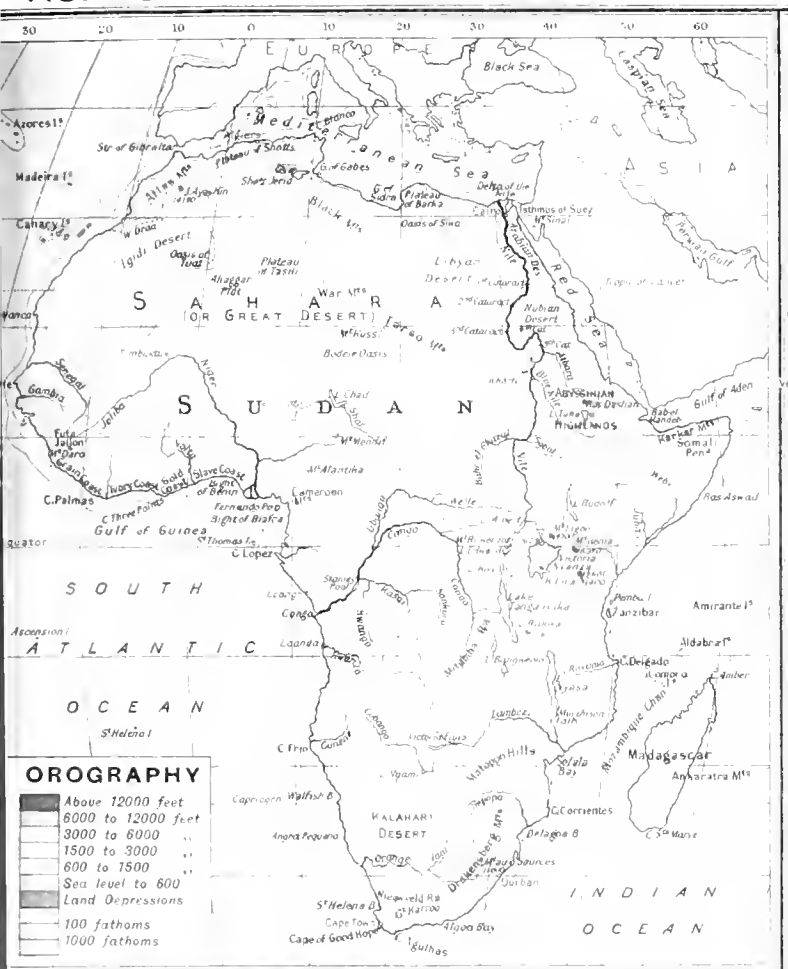


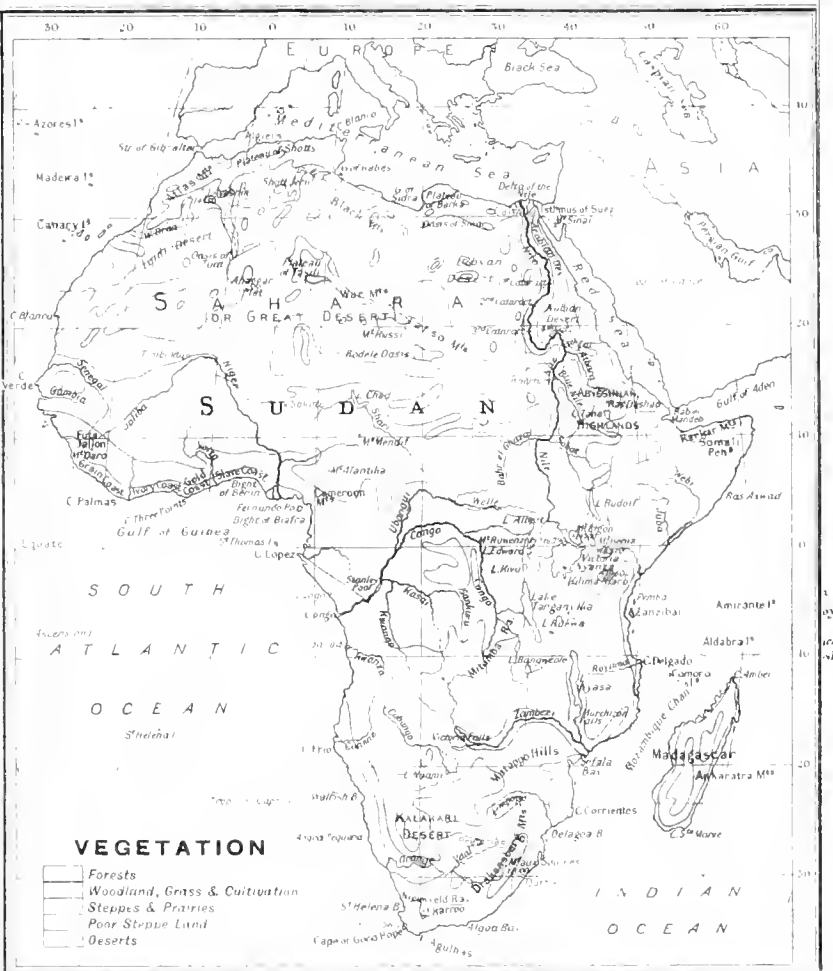


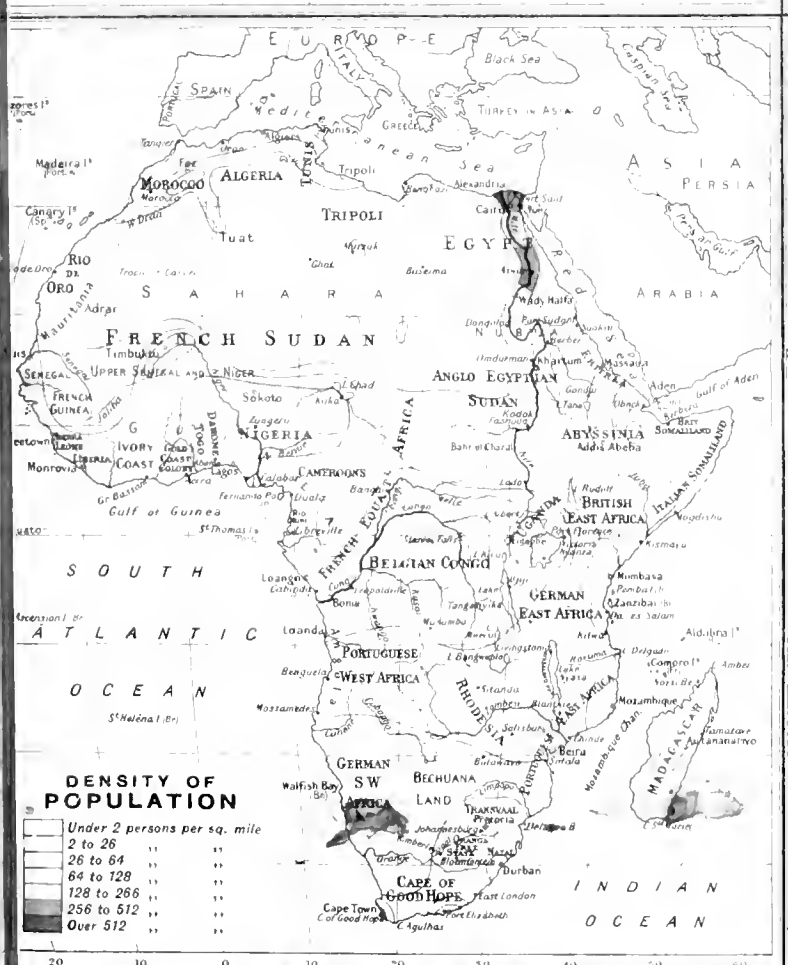


The Edinburgh Geographical Institute

English Miles
0 500 1000



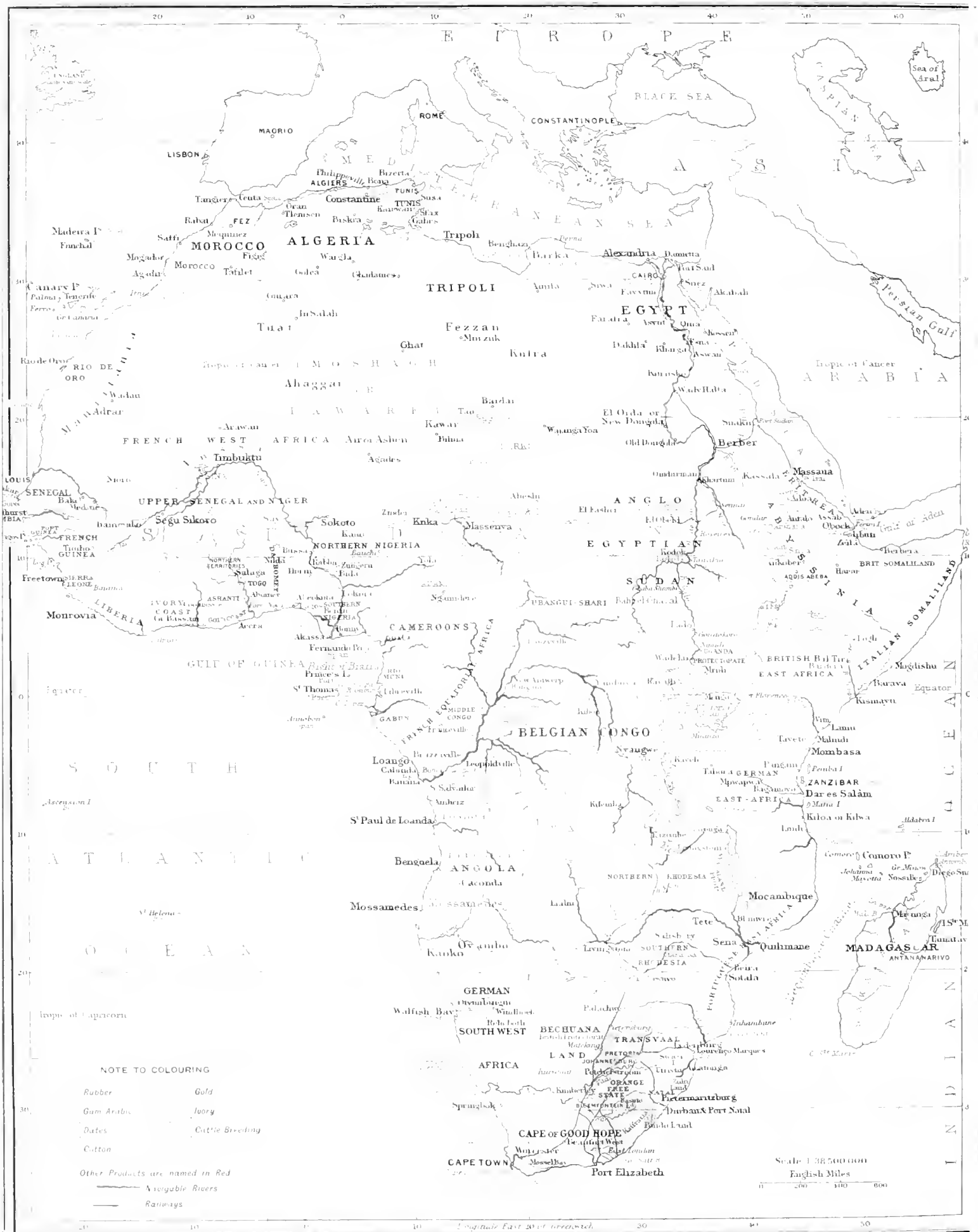




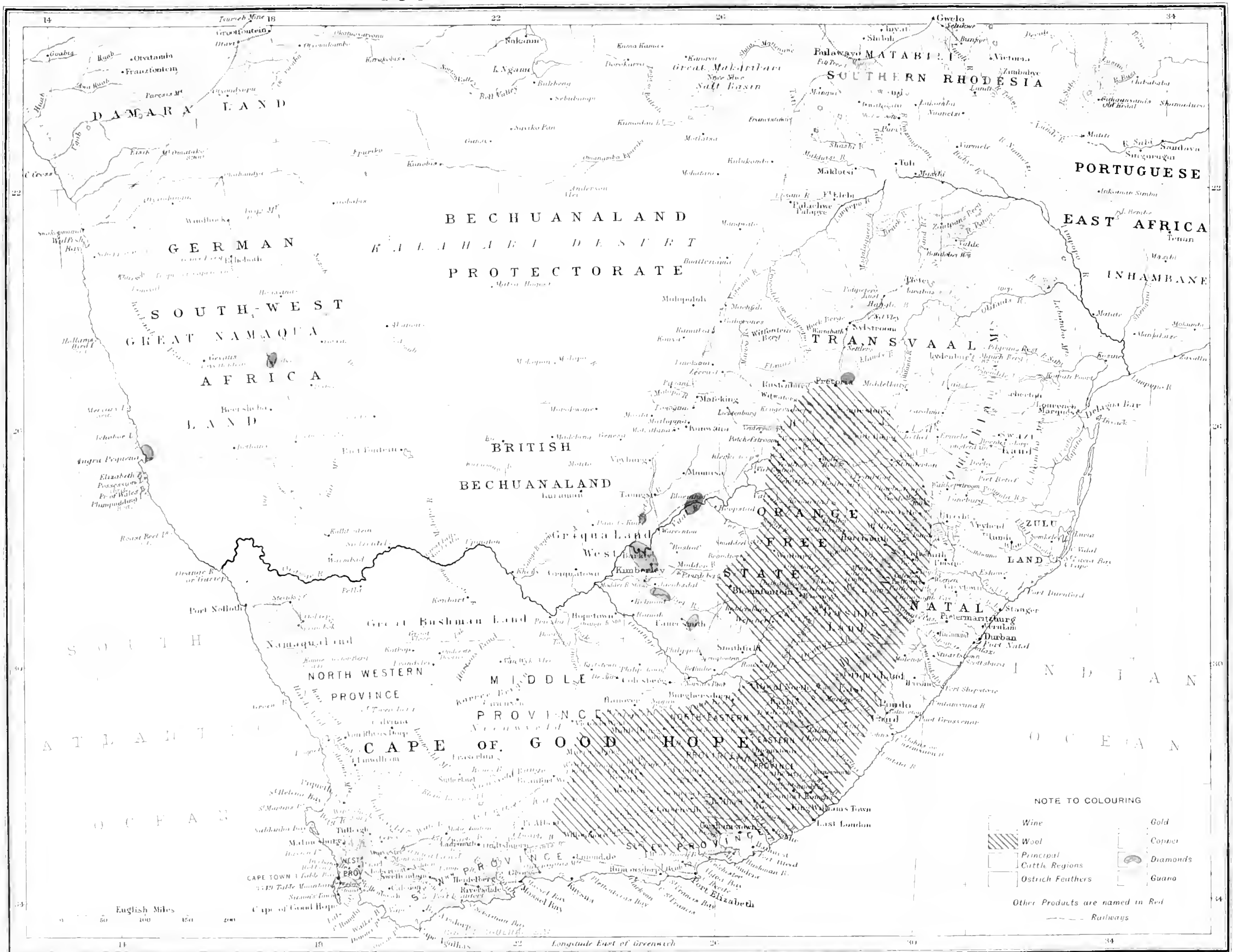
English Miles
0 500 1000

Jos. Bartholomew & C.

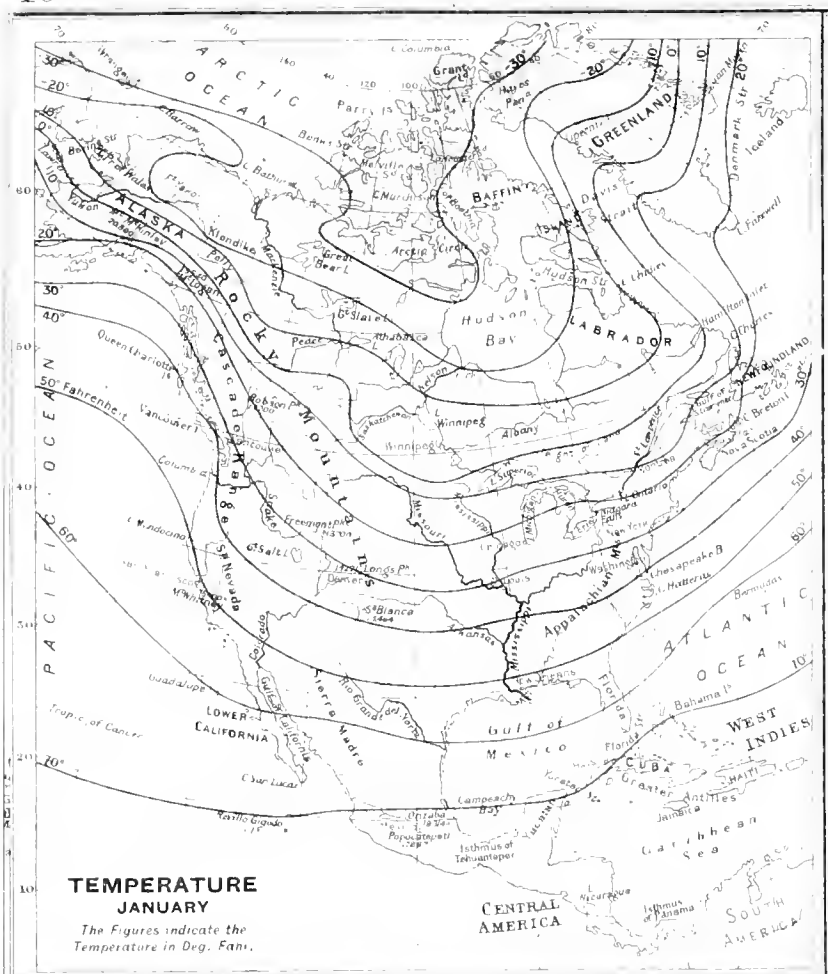
ECONOMIC MAP OF AFRICA



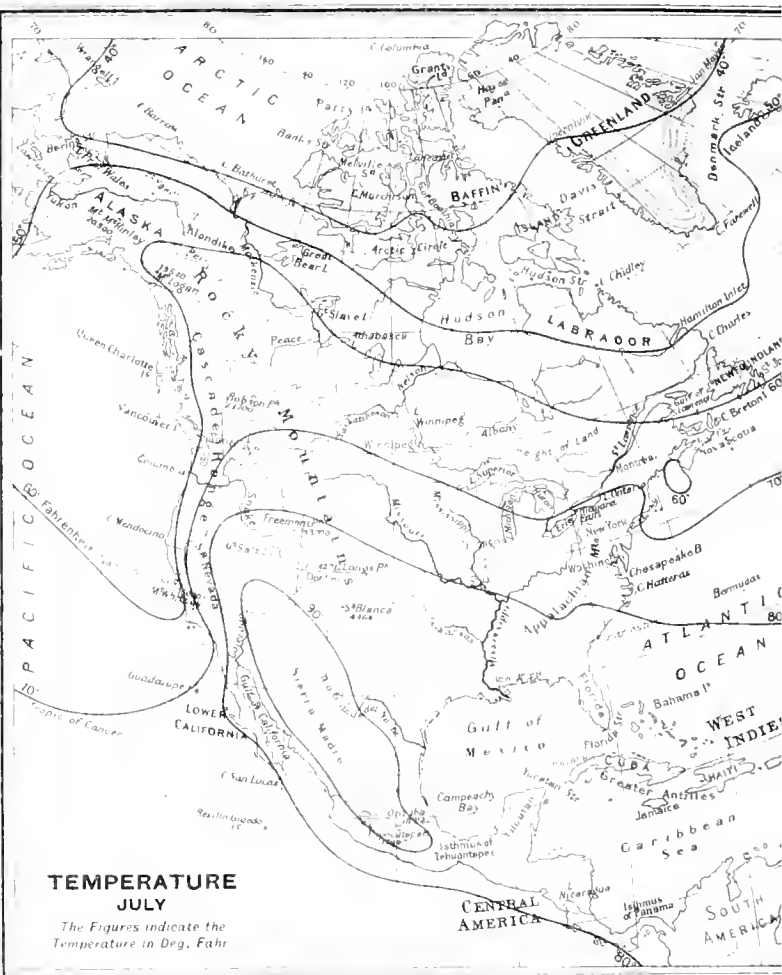
ECONOMIC MAP OF SOUTH AFRICA



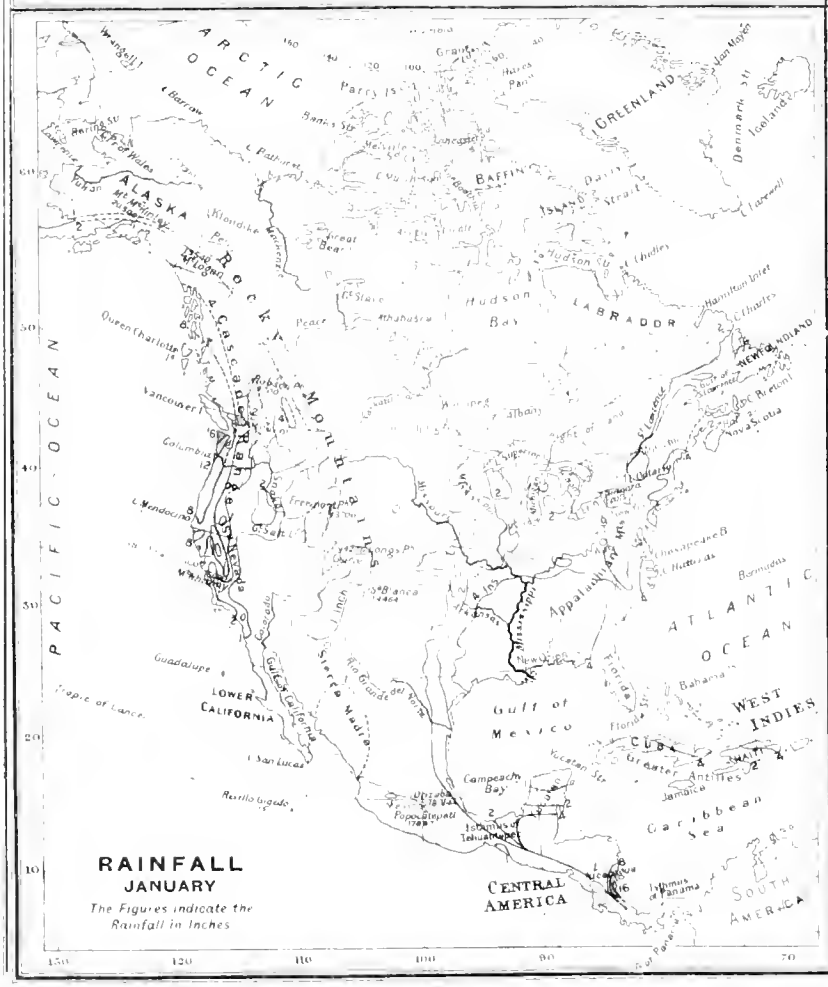
SIBERIA — OROGRAPHICAL



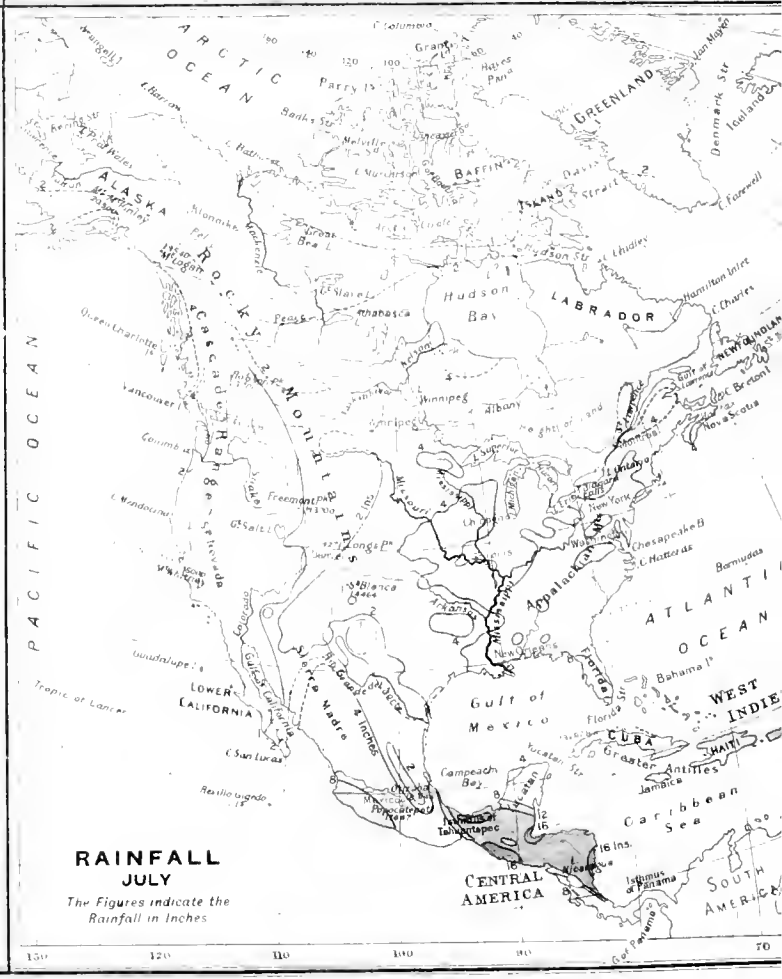
TEMPERATURE
JANUARY
The Figures indicate the Temperature in Deg. Fahr.



TEMPERATURE
JULY
The Figures indicate the Temperature in Deg. Fahr.



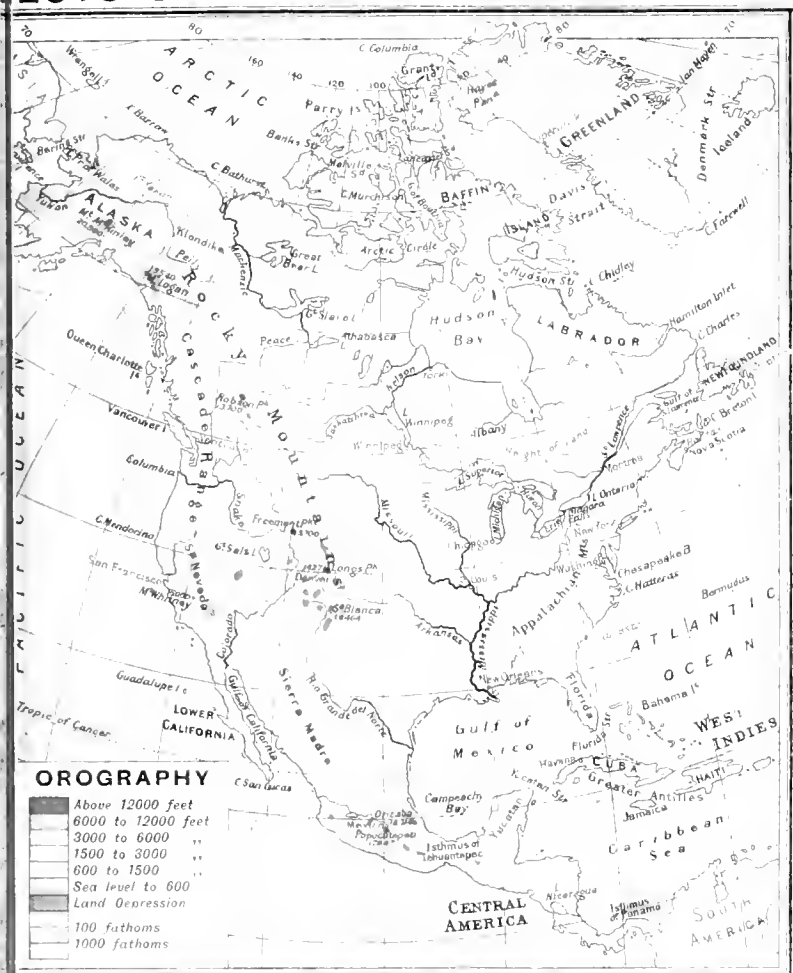
RAINFALL
JANUARY
The Figures indicate the Rainfall in Inches

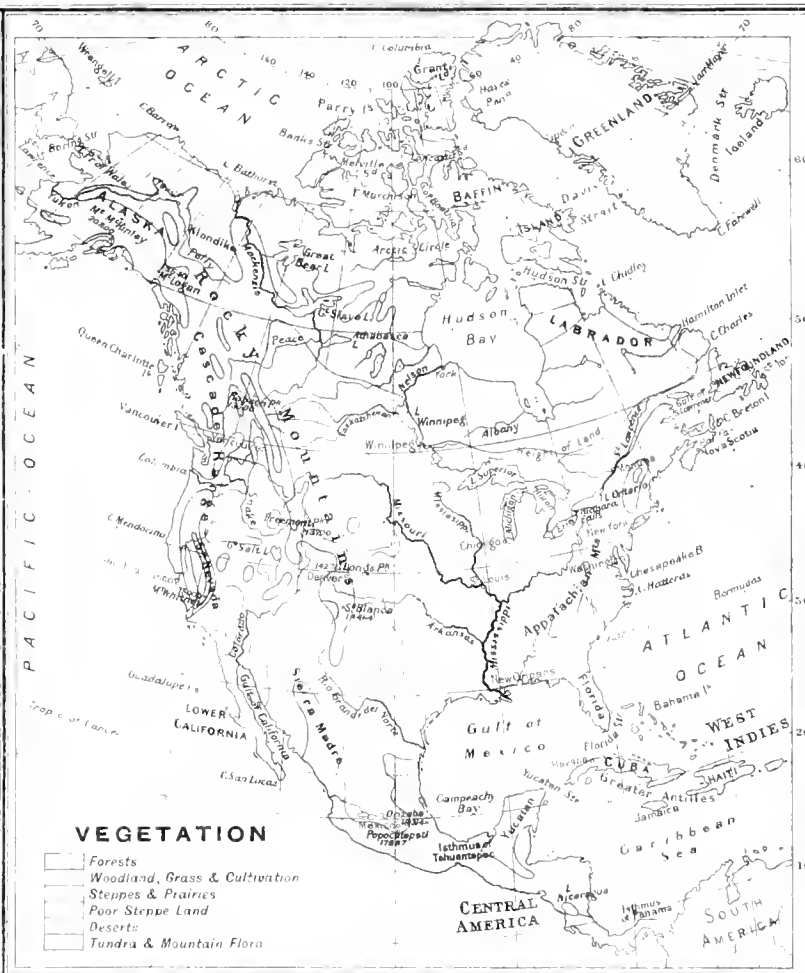


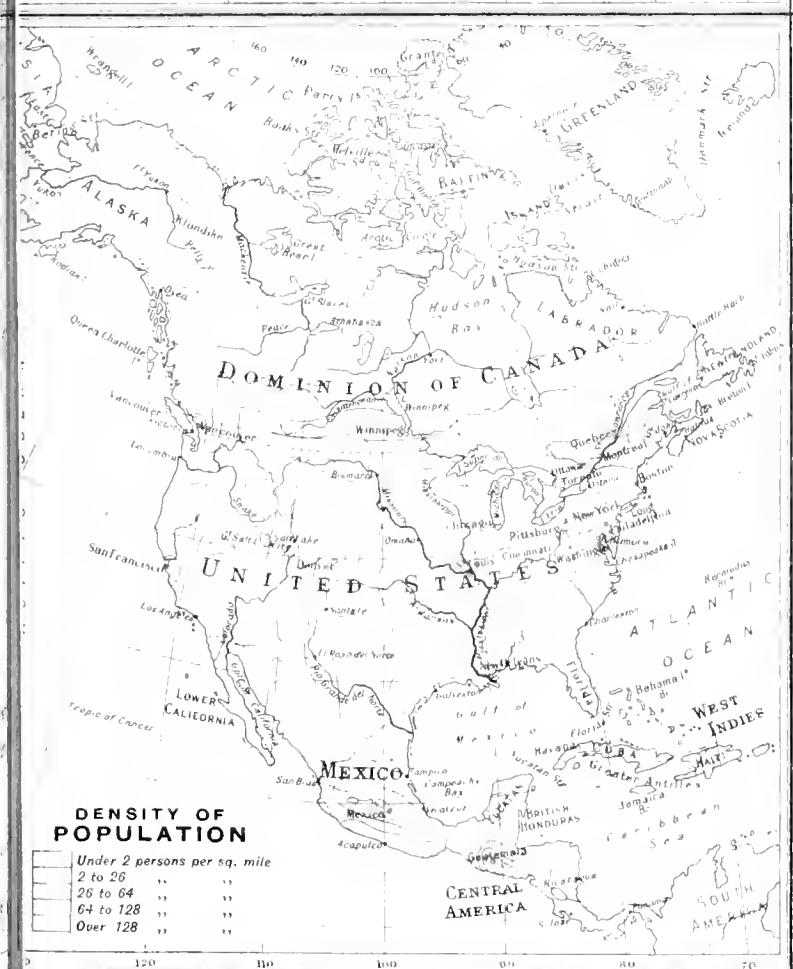
RAINFALL
JULY
The Figures indicate the Rainfall in Inches

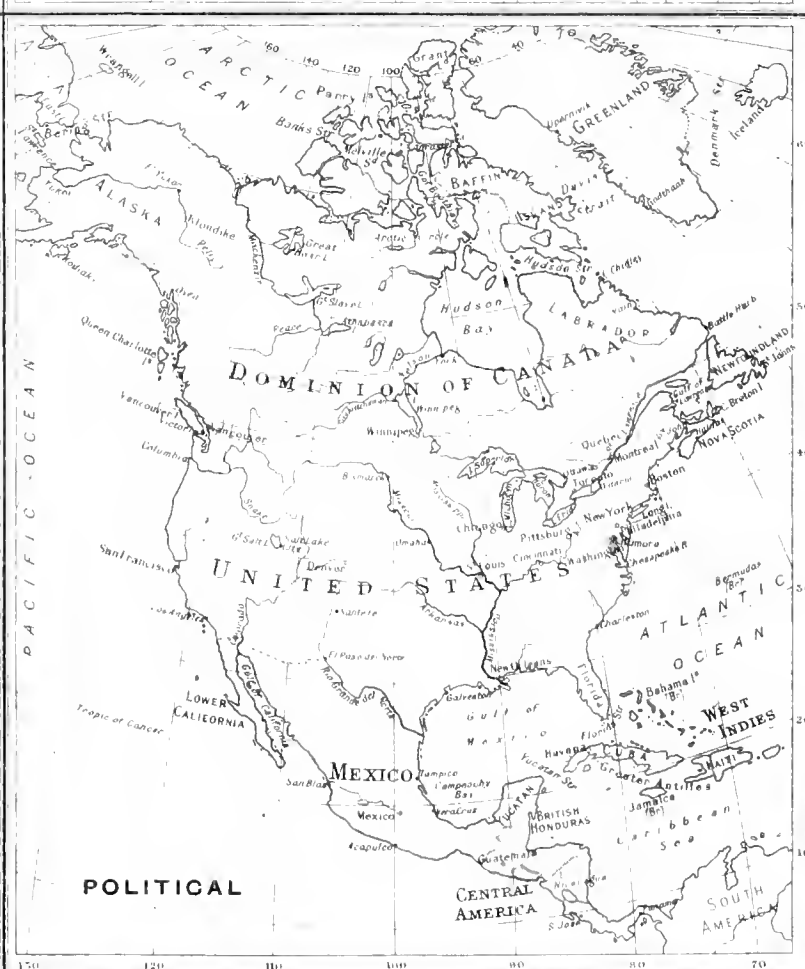
The Edinburgh Geographical Institute

English Miles
0 500 1000





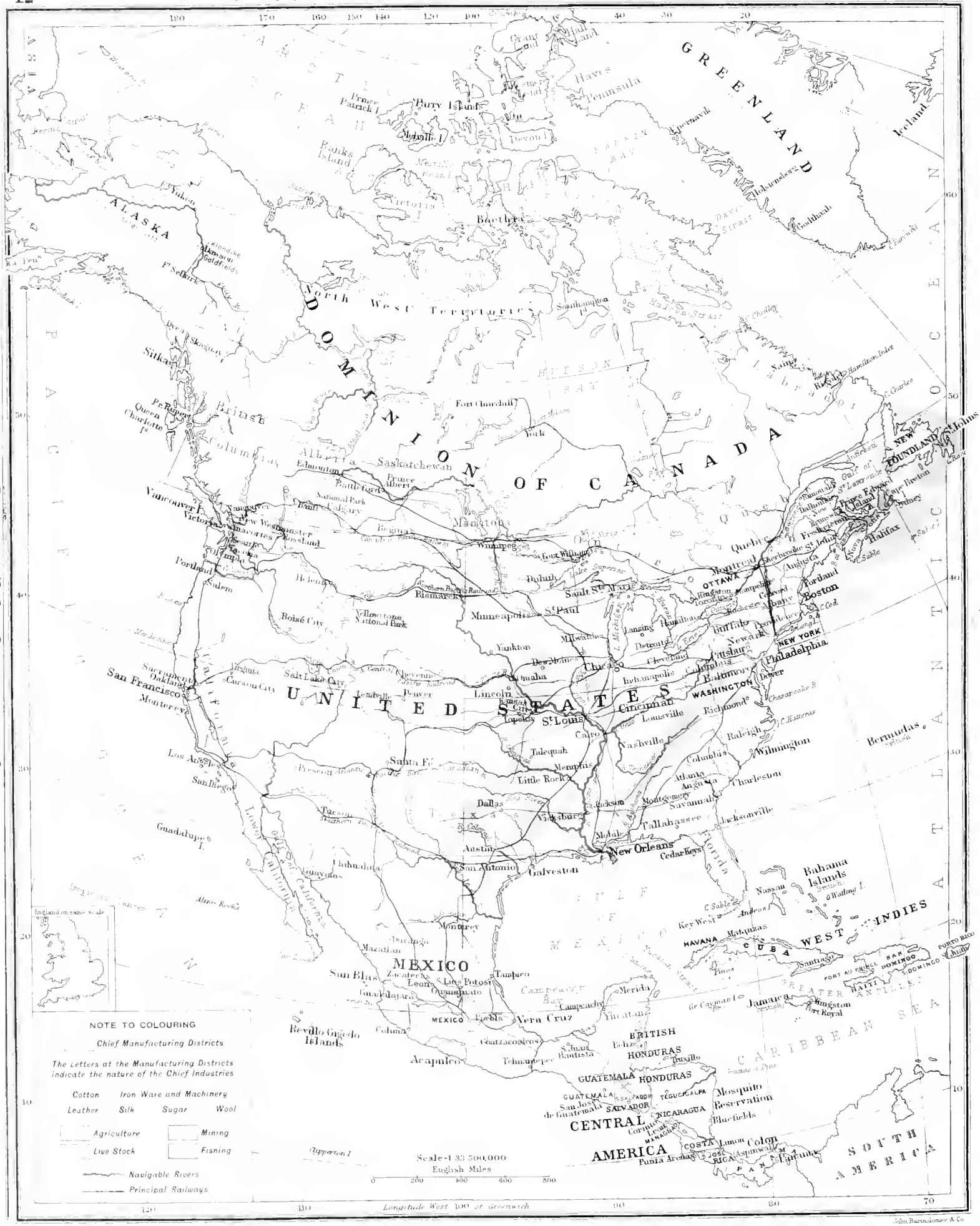




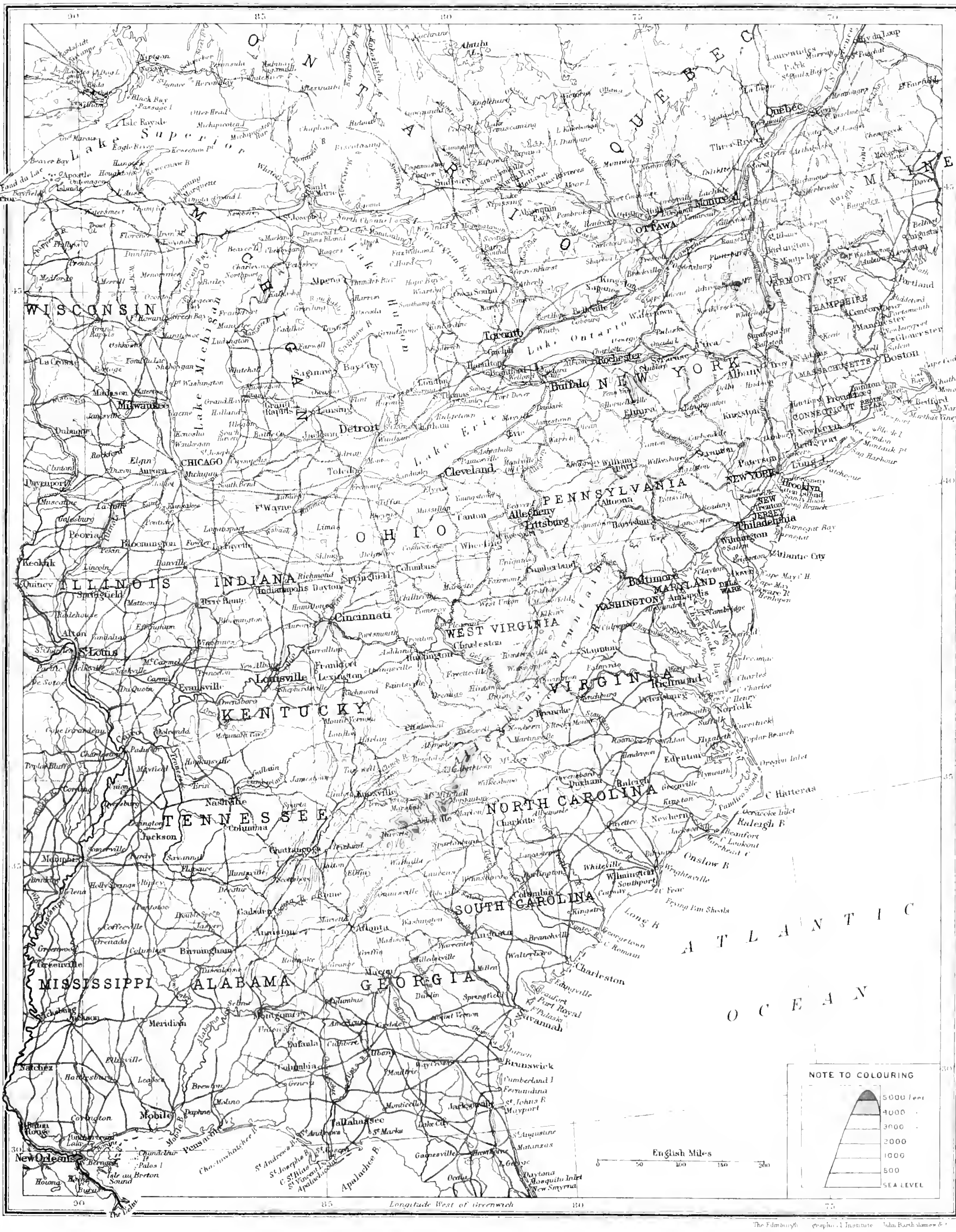
English Miles

John Bartholomew & Co

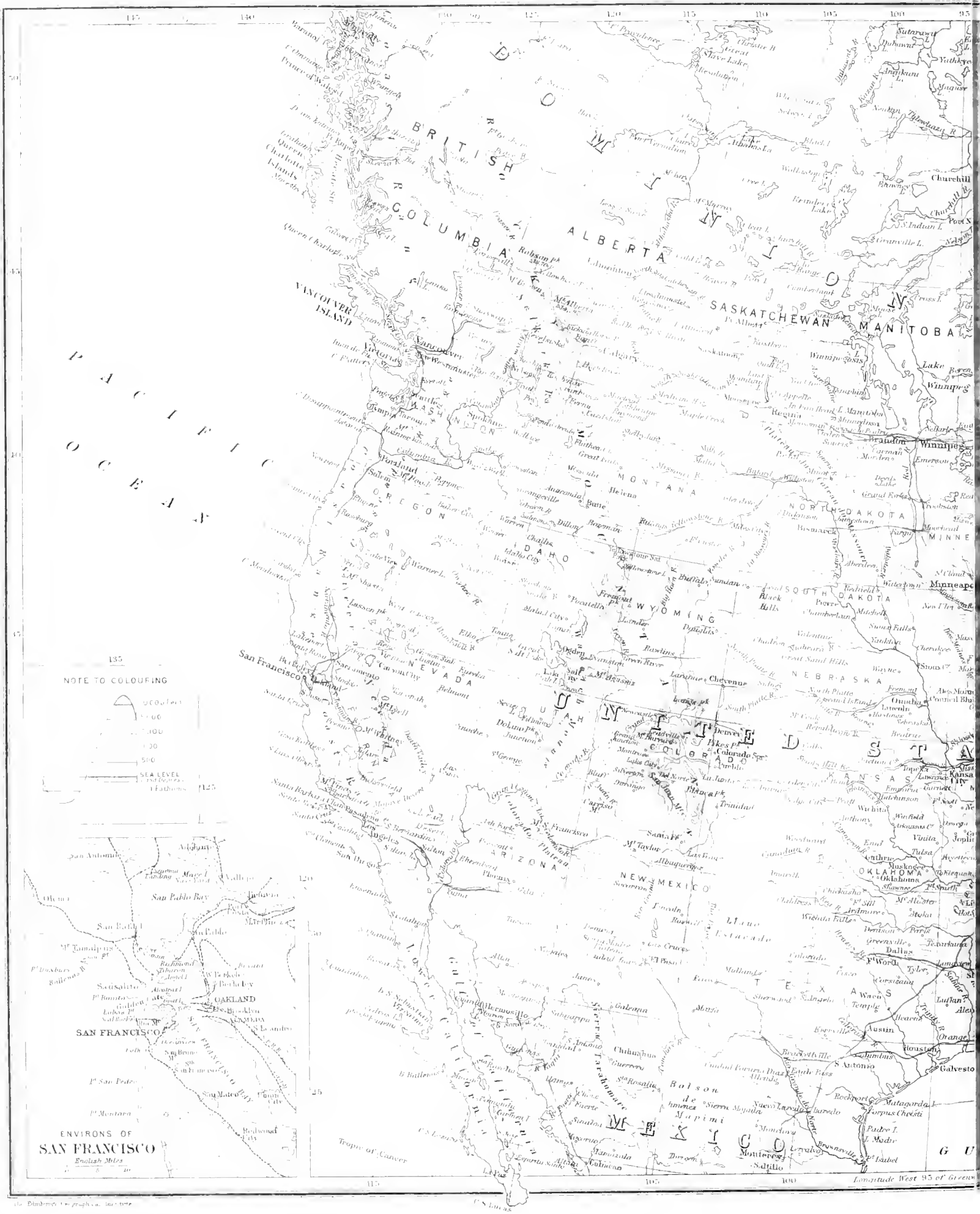
INDUSTRIAL MAP OF NORTH AMERICA

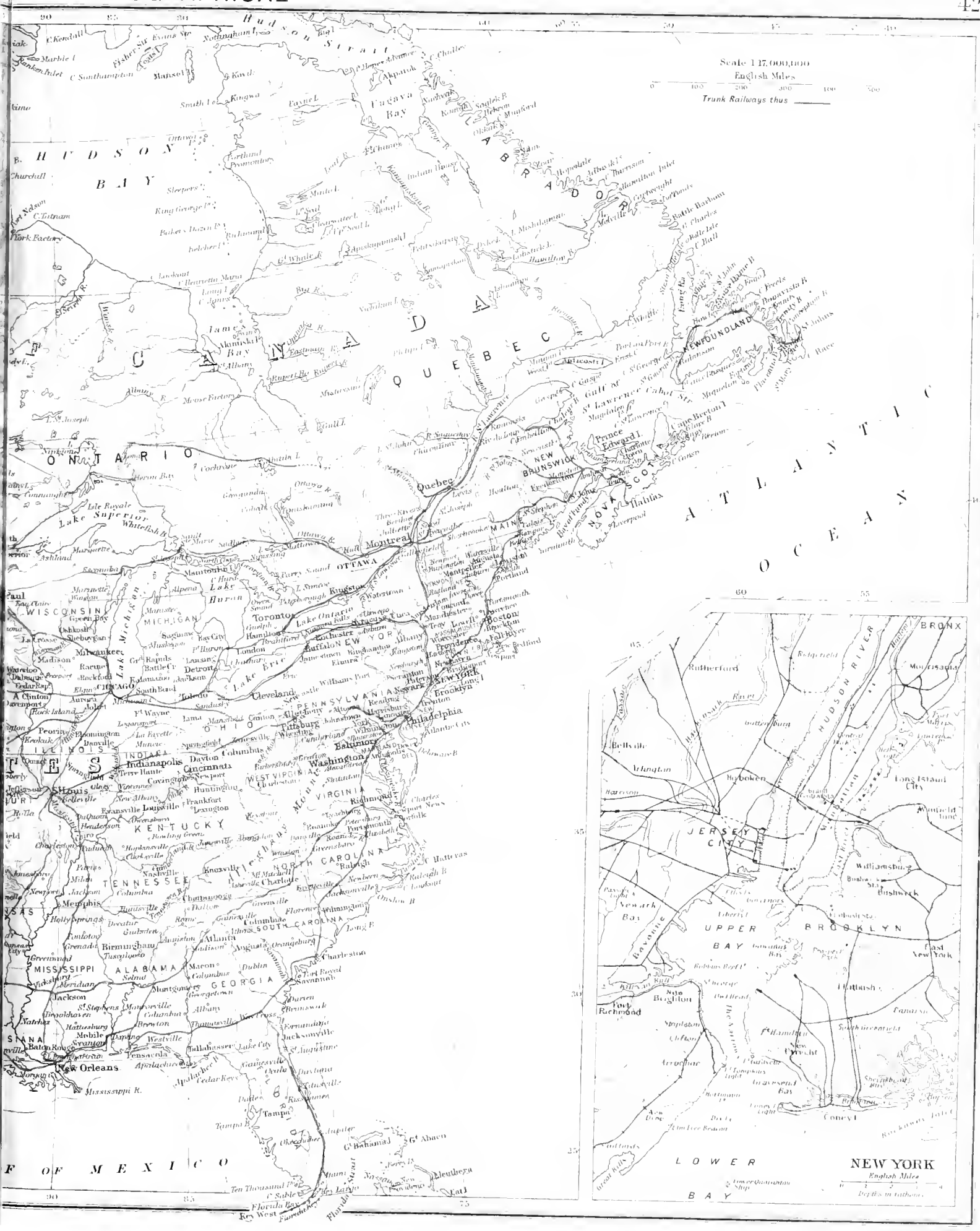


John Bartholomew & Co.



The Edinburgh Geographical Institute John Bartholomew & Co.


PACIFIC OCEAN
BRITISH COLUMBIA
ALBERTA
SASKATCHEWAN
MANITOBA
VANCOUVER ISLAND
Queen Charlotte Islands
WASHINGTON
OREGON
NEVADA
IDAHO
MONTANA
WYOMING
UTAH
COLORADO
ARIZONA
NEW MEXICO
NORTH DAKOTA
SOUTH DAKOTA
NEBRASKA
KANSAS
OKLAHOMA
TEXAS
MINNESOTA
Hudson Bay
Lake Superior
Lake Winnipeg
Churchill
Winnipeg
Minneapolis
Kansas City
Omaha
Denver
Chicago
Dallas
Houston
Austin
San Antonio
Galveston
San Francisco
Oakland
Los Angeles
Salt Lake City
Portland
Seattle
Vancouver
Victoria
Calgary
Edmonton
Regina
Saskatoon
Winnipeg
Duluth
Milwaukee
Memphis
New Orleans
Atlanta
Washington
Boston
New York
Philadelphia
Pittsburgh
Cleveland
Detroit
Toronto
Montreal
Ottawa
Quebec
Halifax
St. John
Fredericton
Charlottetown
Prince Edward Island
Nova Scotia
New Brunswick
Newfoundland
Labrador
Hudson Strait
Baffin Island
Ellesmere Island
Greenland
Iceland
Gulf of Mexico
Mexico
Chihuahua
Monterrey
Saltillo
Nuevo Laredo
Matamoros
Brownsville
Corpus Christi
Rio Grande
Colorado R.
Columbia R.
Missouri R.
Mississippi R.
Ohio R.
Tropic of Cancer
Longitude West 95 of Greenw
NOTE TO COLOURING
SEA LEVEL
Fathoms
ENVIRONS OF
SAN FRANCISCO
English Miles

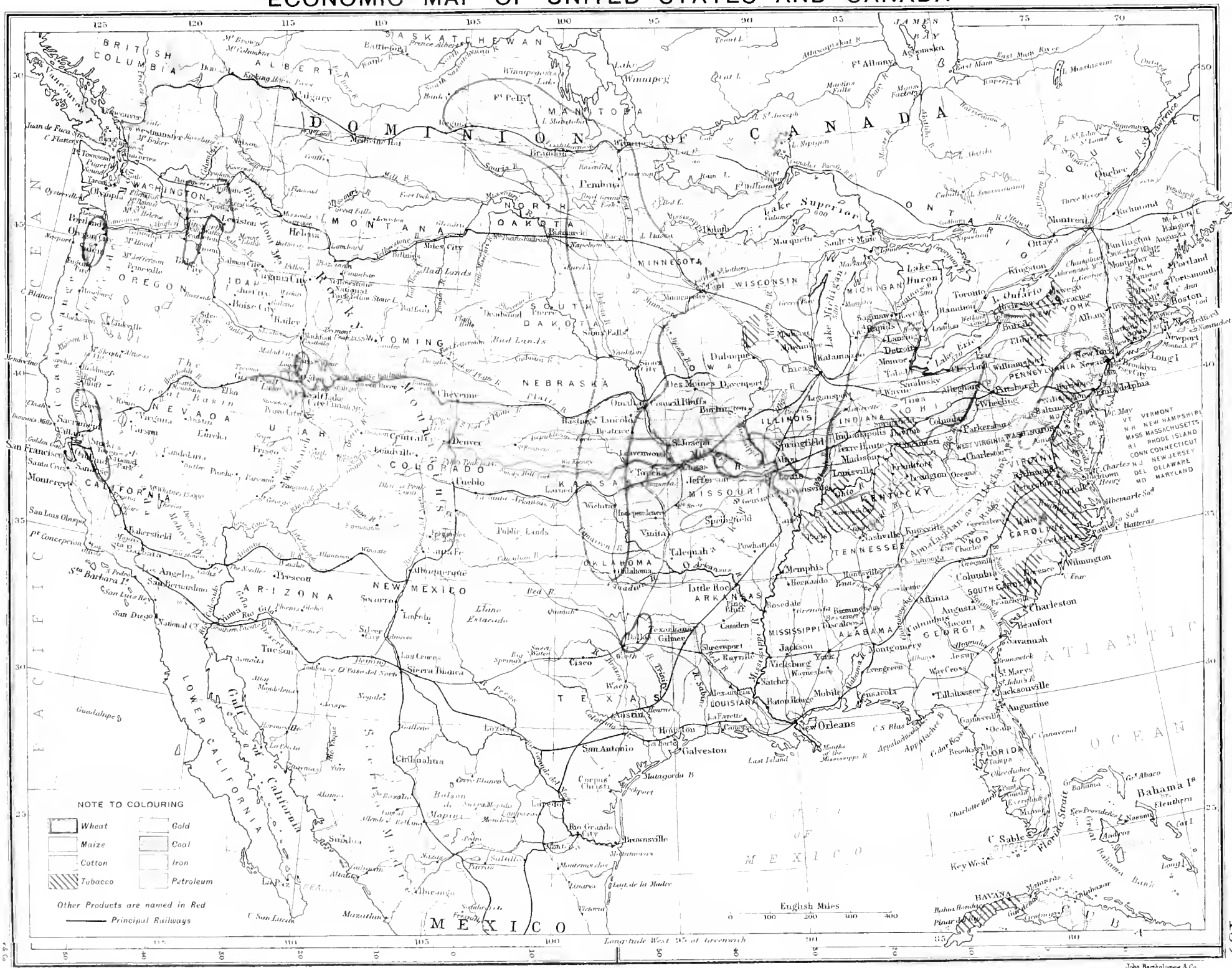

Scale 1:17,000,000
English Miles
0 100 200 300 400 500
Trunk Railways thus
Hudson Strait
HUDSON BAY
Foxe Channel
Foxe Basin
Fury and Hecla Strait
Baffin Bay
Davis Strait
Labrador
Ungava Bay
Hudson Bay
James Bay
Gulf of St. Lawrence
Cabot Str.
Belle Isle
Newfoundland
Prince Edward I.
Cape Breton I.
NEW BRUNSWICK
NOVA SCOTIA
MAINE
QUEBEC
ONTARIO
Lake Superior
Lake Michigan
Lake Huron
Lake Erie
Lake Ontario
Quebec
Montreal
OTTAWA
Toronto
Boston
NEW YORK
Philadelphia
Baltimore
Washington
Cleveland
Chicago
Detroit
Buffalo
Pittsburg
Cincinnati
Indianapolis
St. Louis
Louisville
Memphis
New Orleans
Mississippi R.
Florida
Key West
Havana
Bahamas
Bermuda
Halifax
Labrador
ATLANTIC OCEAN
GULF OF MEXICO
WISCONSIN
MICHIGAN
ILLINOIS
INDIANA
OHIO
KENTUCKY
TENNESSEE
MISSISSIPPI
ALABAMA
GEORGIA
SOUTH CAROLINA
NORTH CAROLINA
VIRGINIA
WEST VIRGINIA
PENNSYLVANIA
NEW YORK
MAINE
VERMONT
NEW HAMPSHIRE
MASSACHUSETTS
RHODE ISLAND
CONNECTICUT
NEW JERSEY
DELAWARE
MARYLAND
LOUISIANA
TEXAS
ARKANSAS
MISSOURI
IOWA
MINNESOTA
NEBRASKA
KANSAS
OKLAHOMA
NEW YORK
BRONX
Rutherford
Hoboken
JERSEY CITY
Bayonne
Newark Bay
UPPER BAY
LOWER BAY
BROOKLYN
Long Island City
Williamsburg
Bushwick
East New York
Flatbush
Coney I.
Staten I.
Arrochar
Tompkinsville
Quarantine
Sandy Hook
Hudson River
Lower Quarantine Ship
Buoys in fathoms

VEGETATION REGIONS & COMMERCIAL DIVISIONS

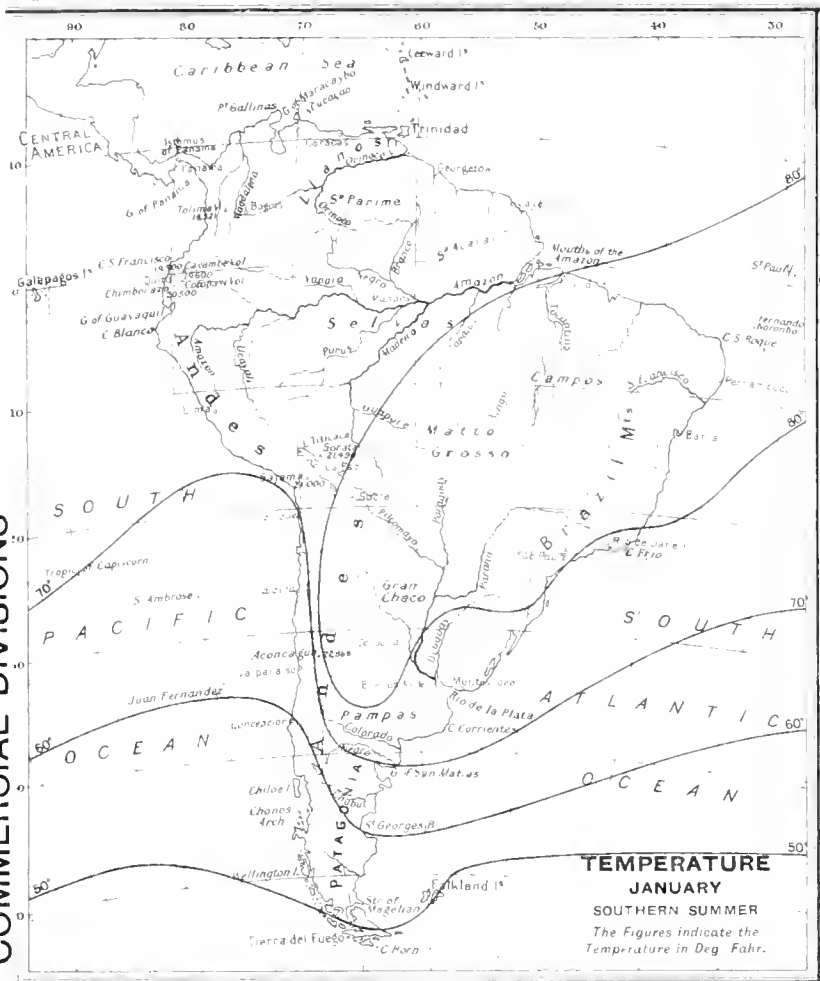
The Edinburgh Geographical Institute

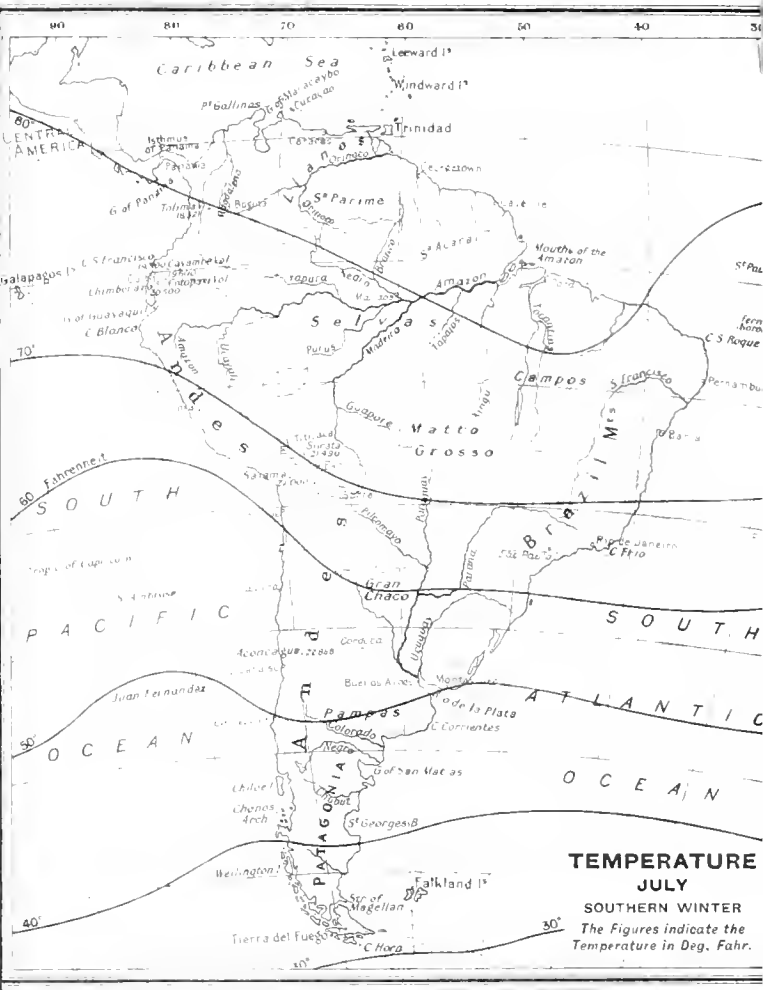
John Bartholomew & Co.

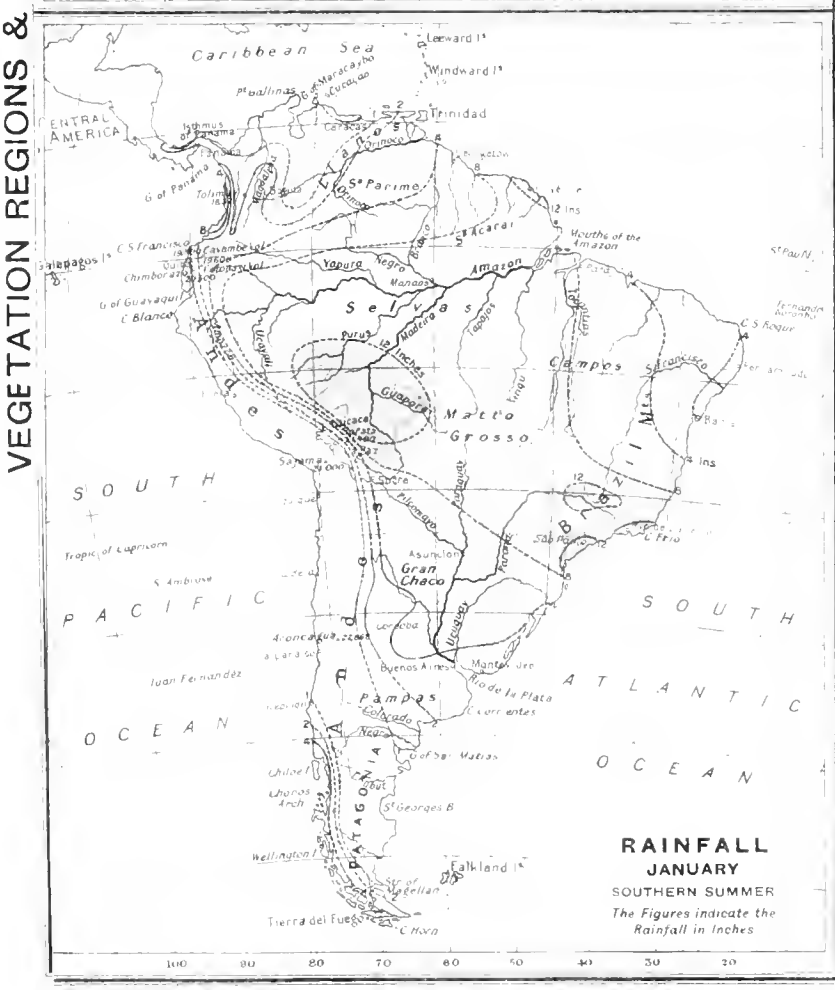
ECONOMIC MAP OF UNITED STATES AND CANADA

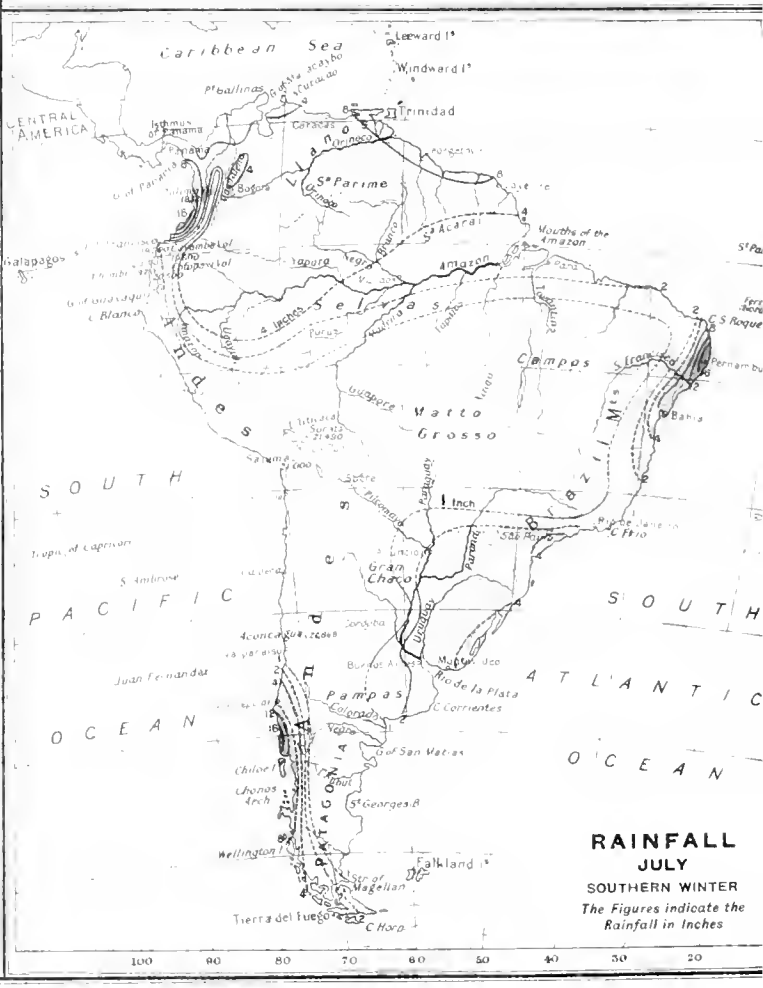


VEGETATION REGIONS & COMMERCIAL DIVISIONS



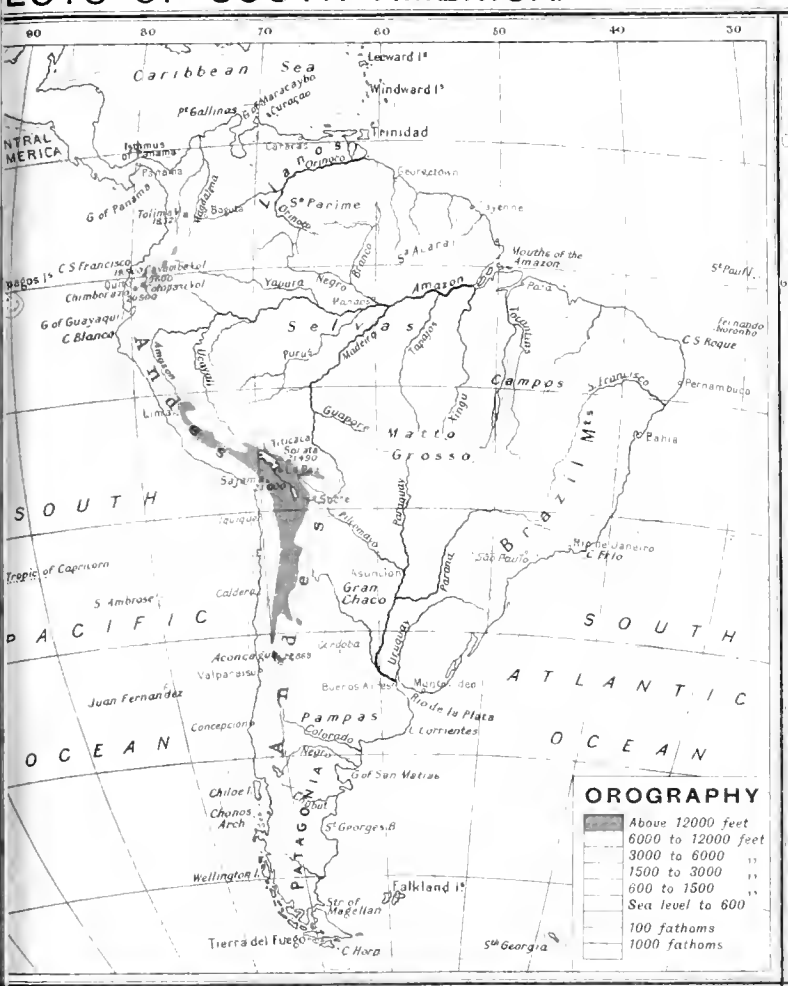


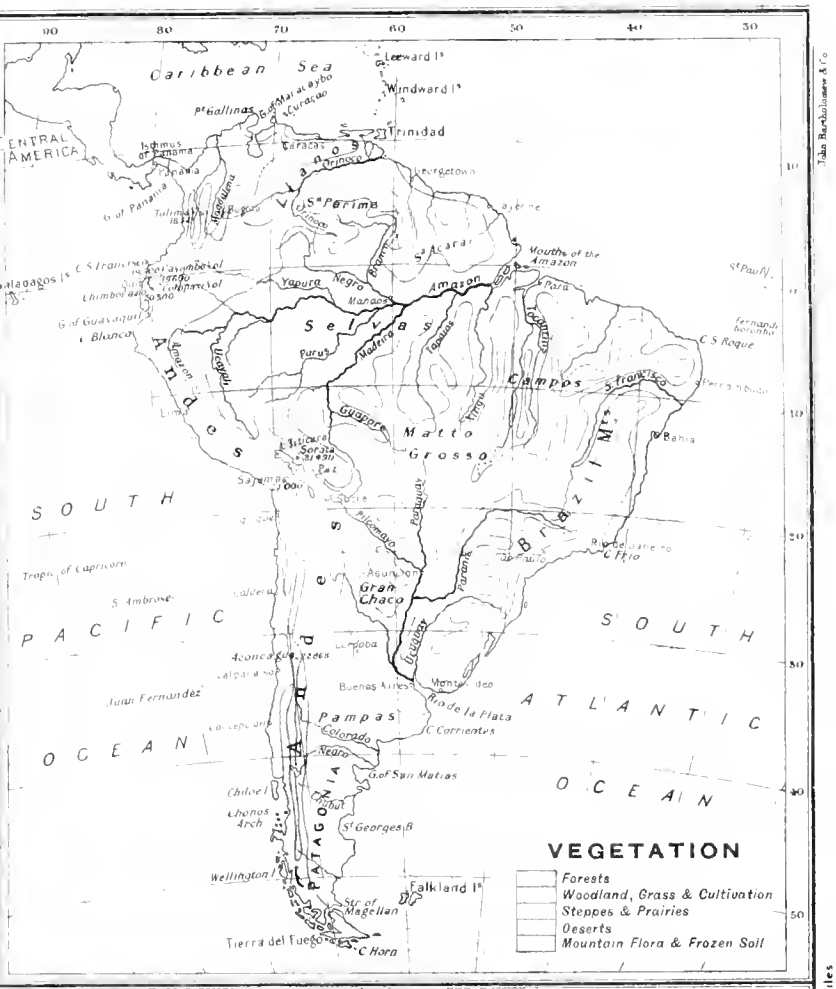


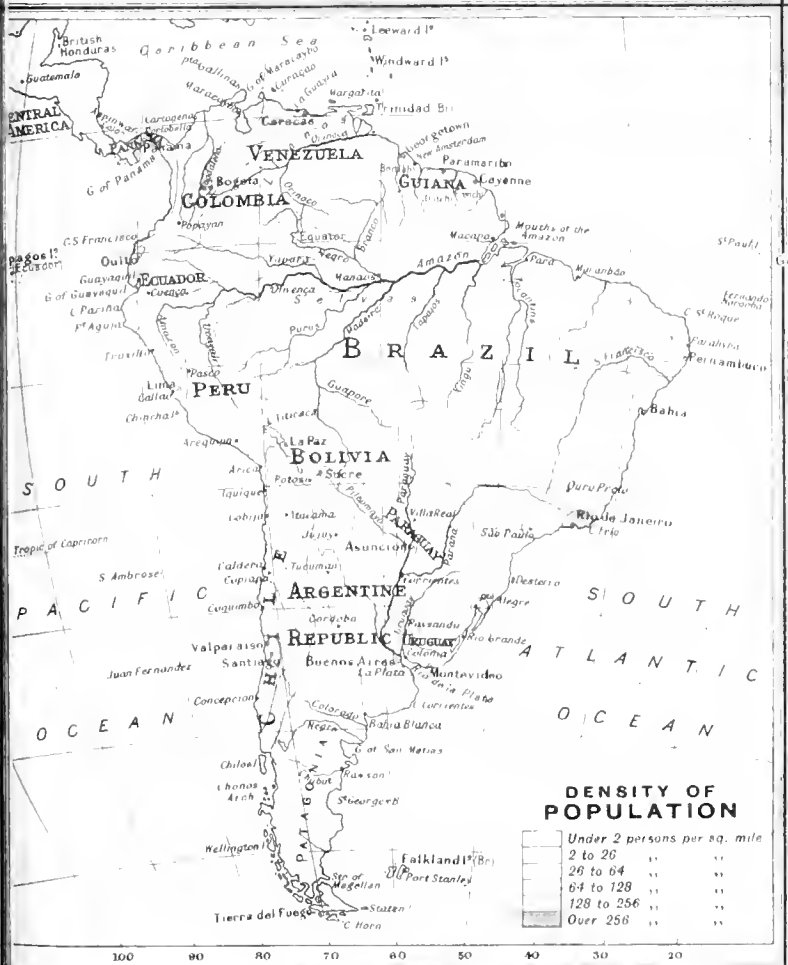


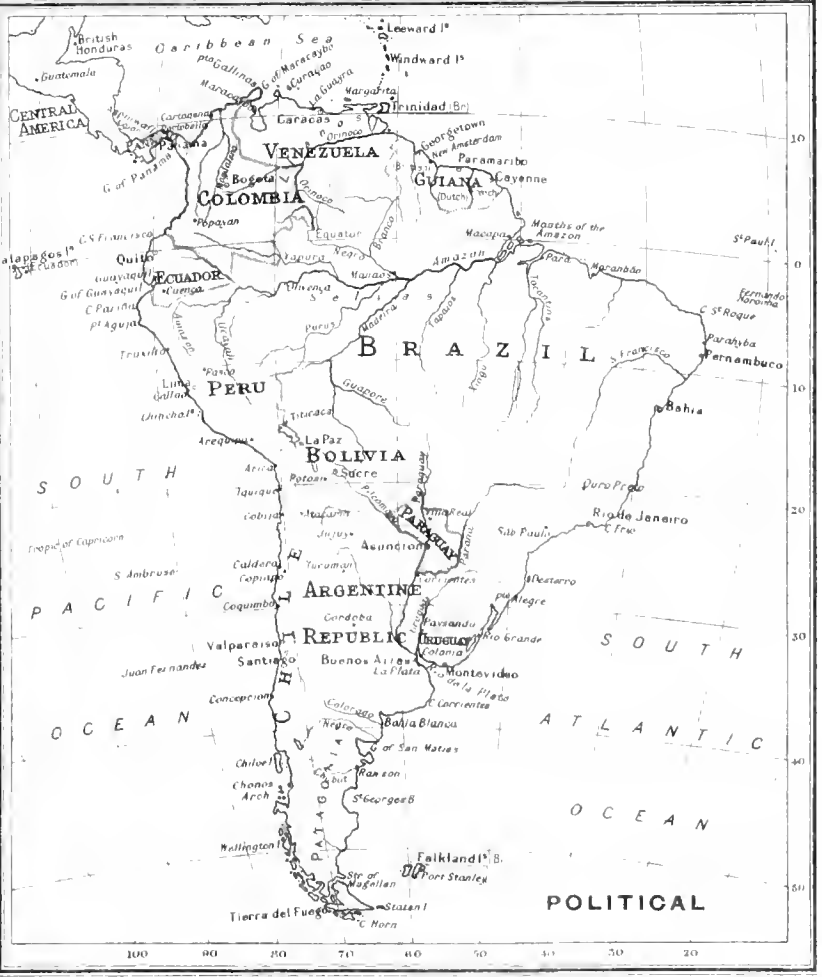
Edinburgh Geographical Institute

English Miles
0 500 1000





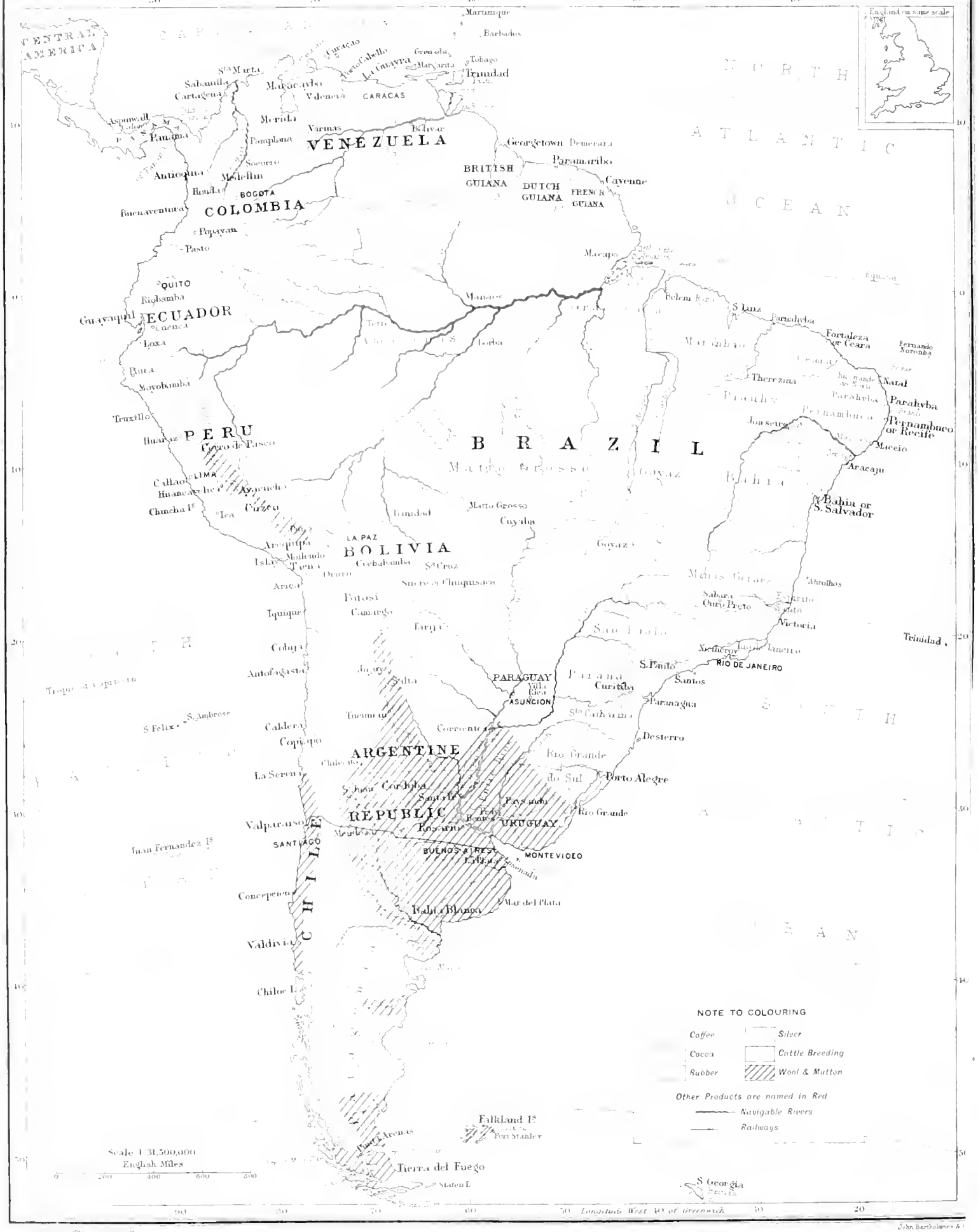




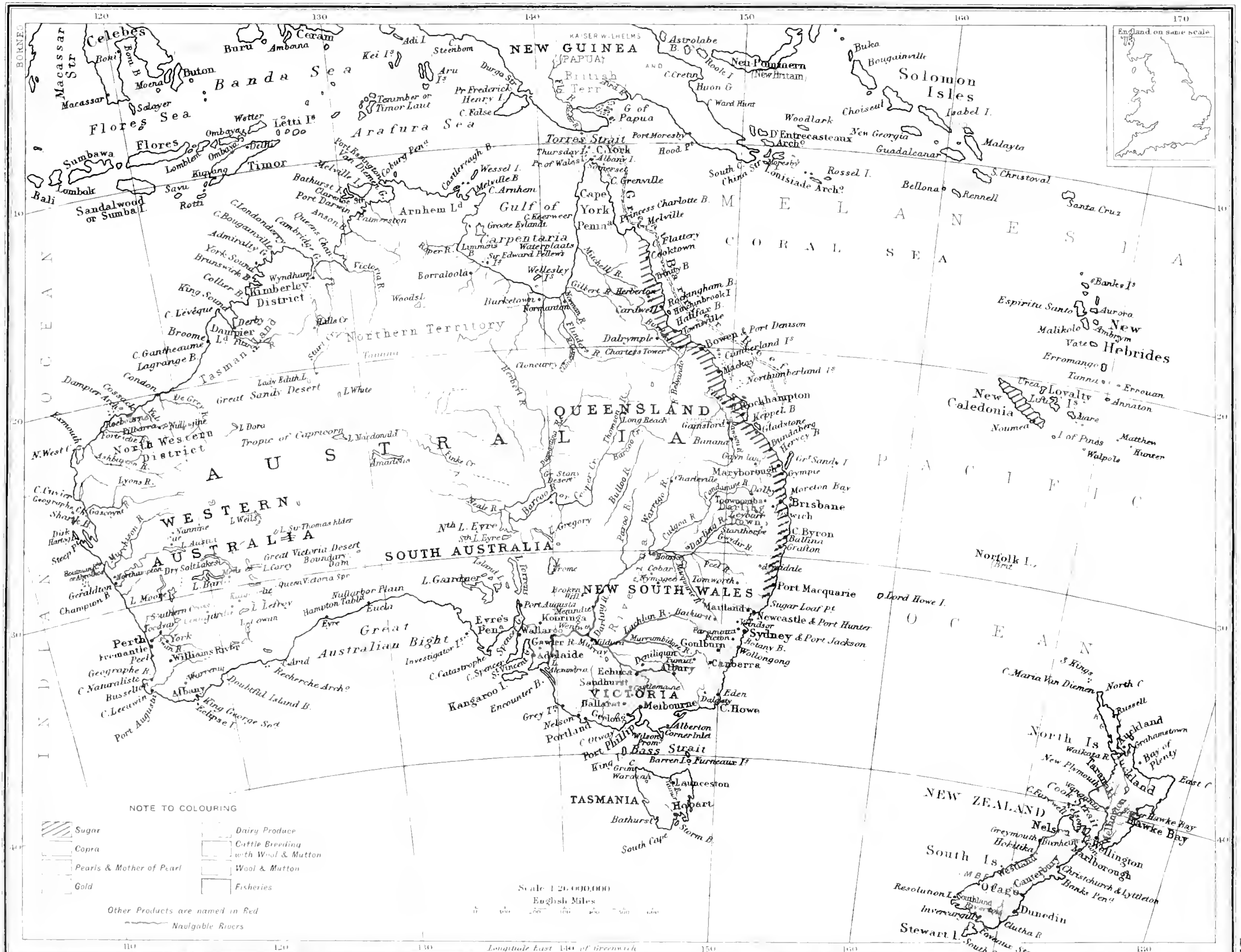
English Miles
0 500 1000

John Bartholomew & Co
The Edinburgh Geographical Institute

ECONOMIC MAP OF SOUTH AMERICA



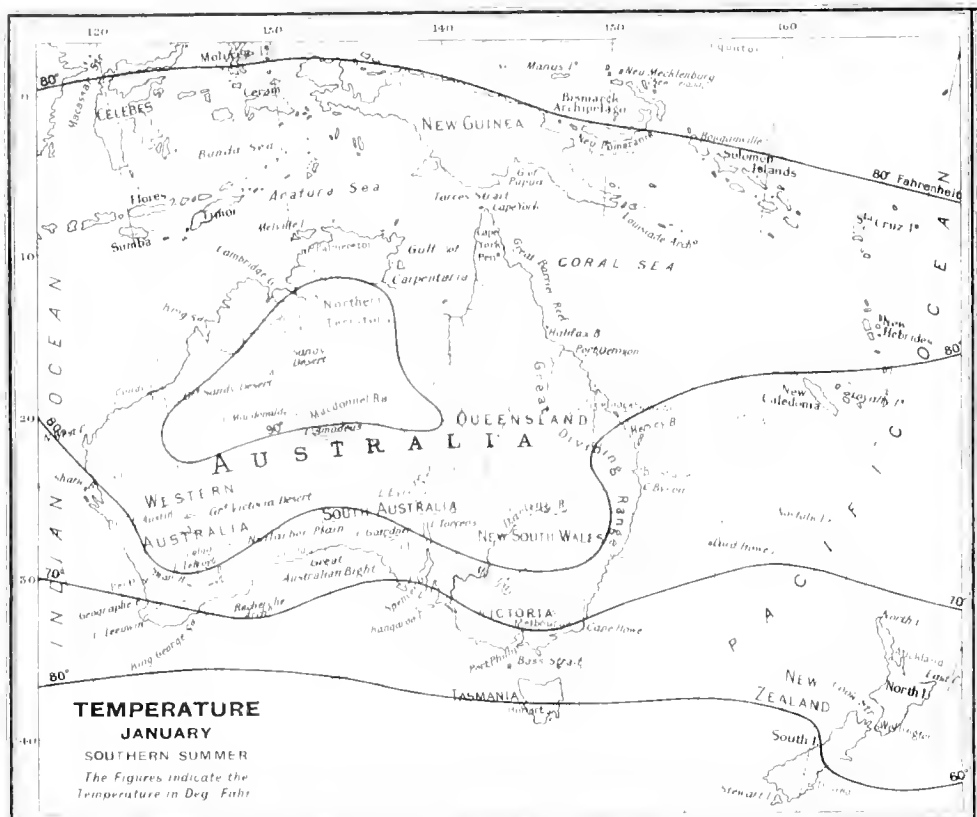
ECONOMIC MAP OF AUSTRALASIA

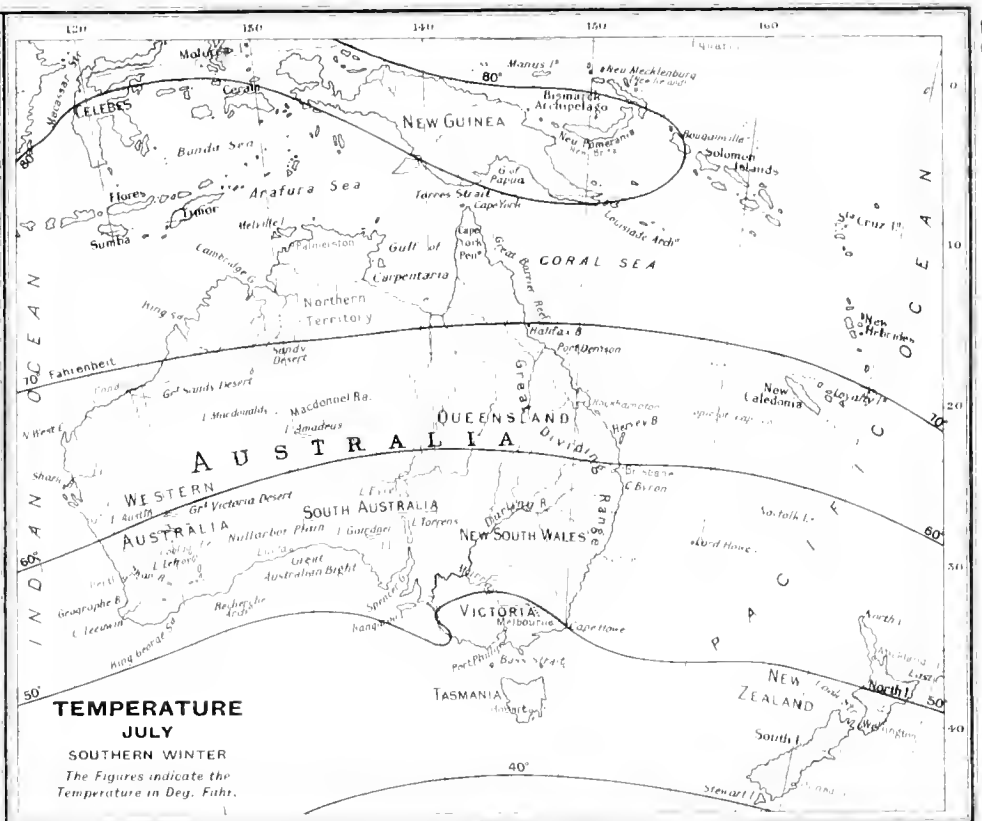


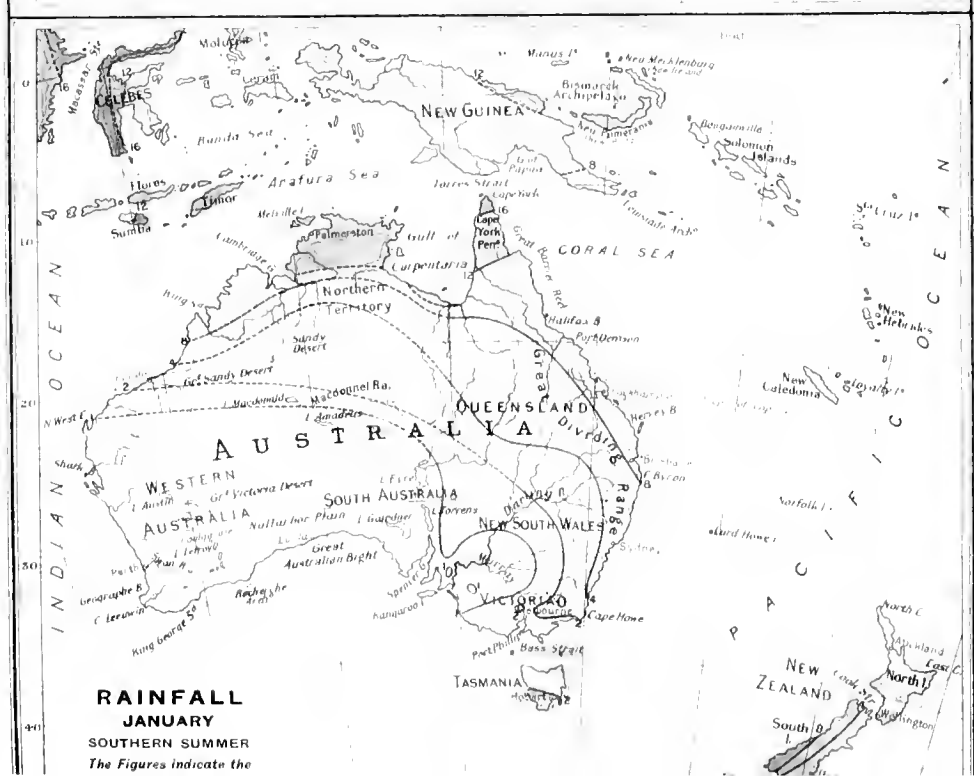
The Edinburgh Geographical Institute

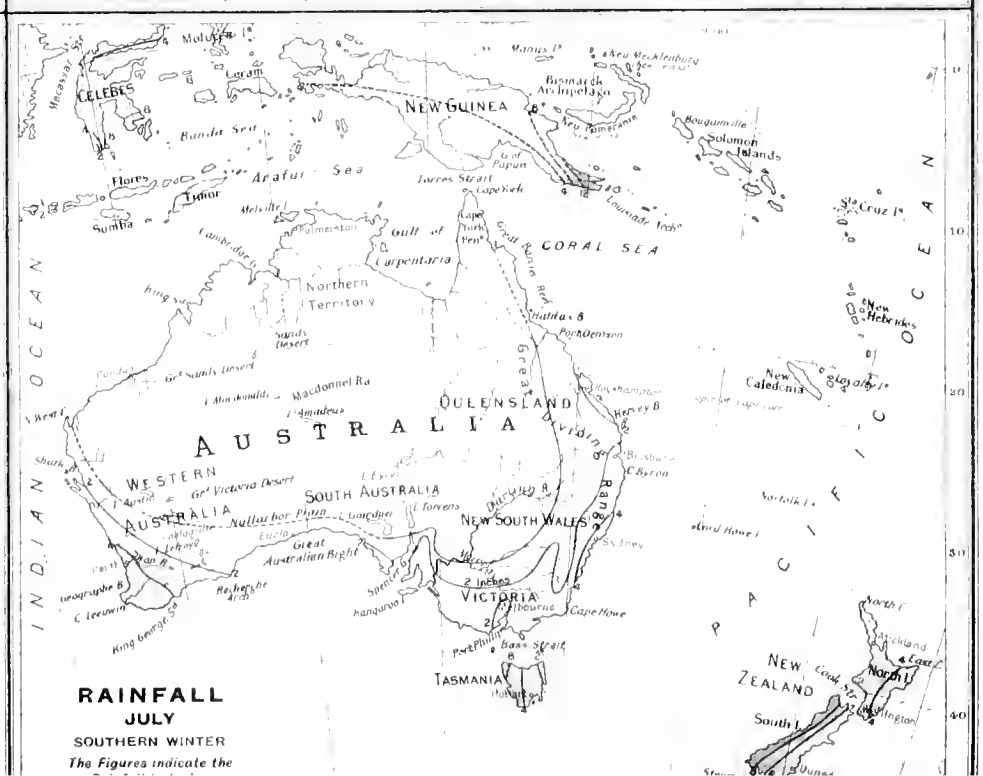
English Miles
0 500 1000

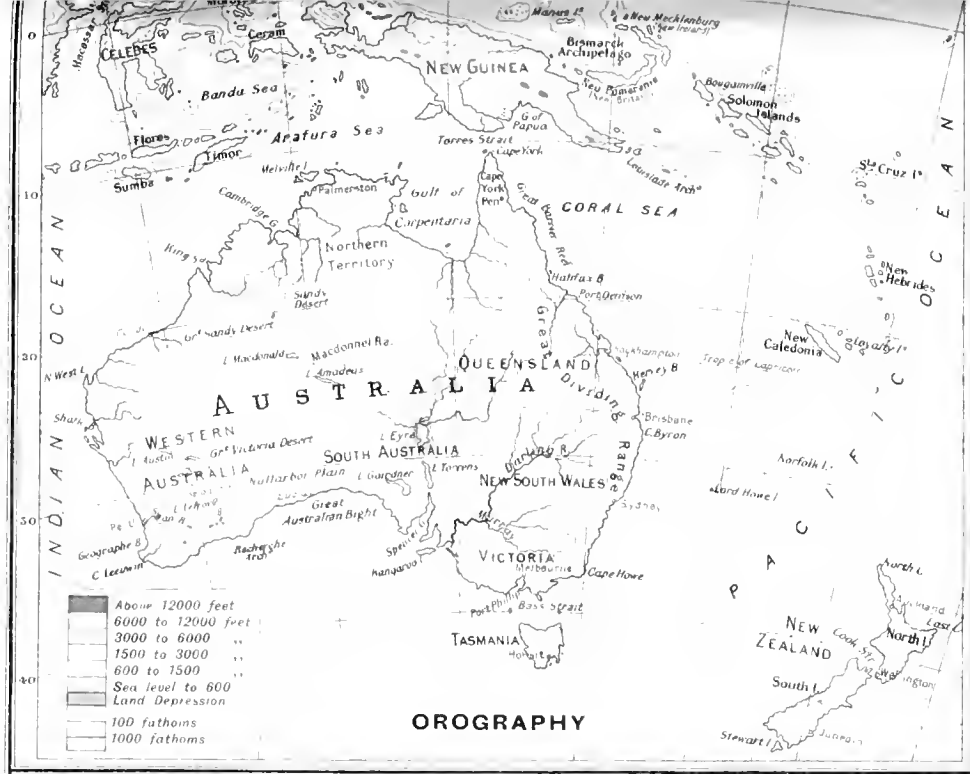
John Bartholomew & Co.


TEMPERATURE
JANUARY
SOUTHERN SUMMER
The Figures indicate the Temperature in Deg. Fahr.
80° Fahrenheit
AUSTRALIA
NEW GUINEA
CELEBES
CORAL SEA
Great Barrier Reef
QUEENSLAND
NEW SOUTH WALES
VICTORIA
SOUTH AUSTRALIA
WESTERN AUSTRALIA
Northern Territory
TASMANIA
NEW ZEALAND
INDIAN OCEAN
PACIFIC OCEAN

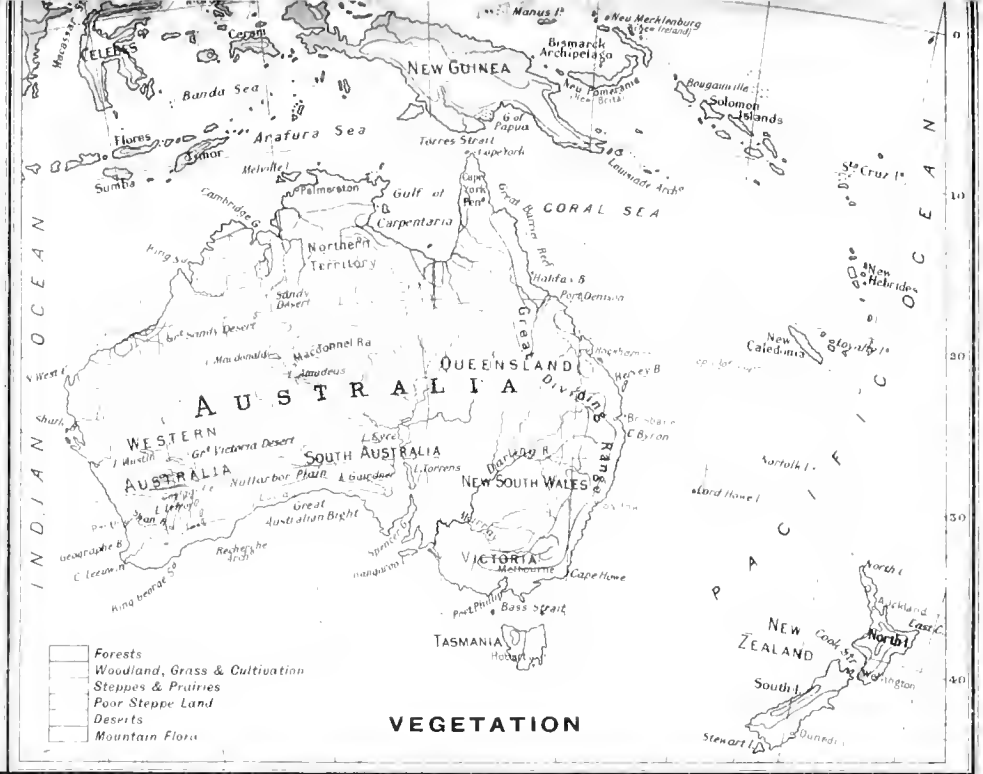

TEMPERATURE
JULY
SOUTHERN WINTER
The Figures indicate the Temperature in Deg. Fahr.
Fahrenheit
AUSTRALIA
NEW GUINEA
CELEBES
CORAL SEA
Great Barrier Reef
QUEENSLAND
NEW SOUTH WALES
VICTORIA
SOUTH AUSTRALIA
WESTERN AUSTRALIA
Northern Territory
TASMANIA
NEW ZEALAND
INDIAN OCEAN
PACIFIC OCEAN


RAINFALL
JANUARY
SOUTHERN SUMMER
The Figures indicate the
AUSTRALIA
NEW GUINEA
CELEBES
CORAL SEA
Great Barrier Reef
QUEENSLAND
NEW SOUTH WALES
VICTORIA
SOUTH AUSTRALIA
WESTERN AUSTRALIA
Northern Territory
TASMANIA
NEW ZEALAND
INDIAN OCEAN
PACIFIC OCEAN


RAINFALL
JULY
SOUTHERN WINTER
The Figures indicate the
2 inches
AUSTRALIA
NEW GUINEA
CELEBES
CORAL SEA
Great Barrier Reef
QUEENSLAND
NEW SOUTH WALES
VICTORIA
SOUTH AUSTRALIA
WESTERN AUSTRALIA
Northern Territory
TASMANIA
NEW ZEALAND
INDIAN OCEAN
PACIFIC OCEAN



OROGRAPHY



VEGETATION

DENSITY OF POPULATION

POLITICAL

English Miles
0 500 1000

The Edinburgh Geographical Institute
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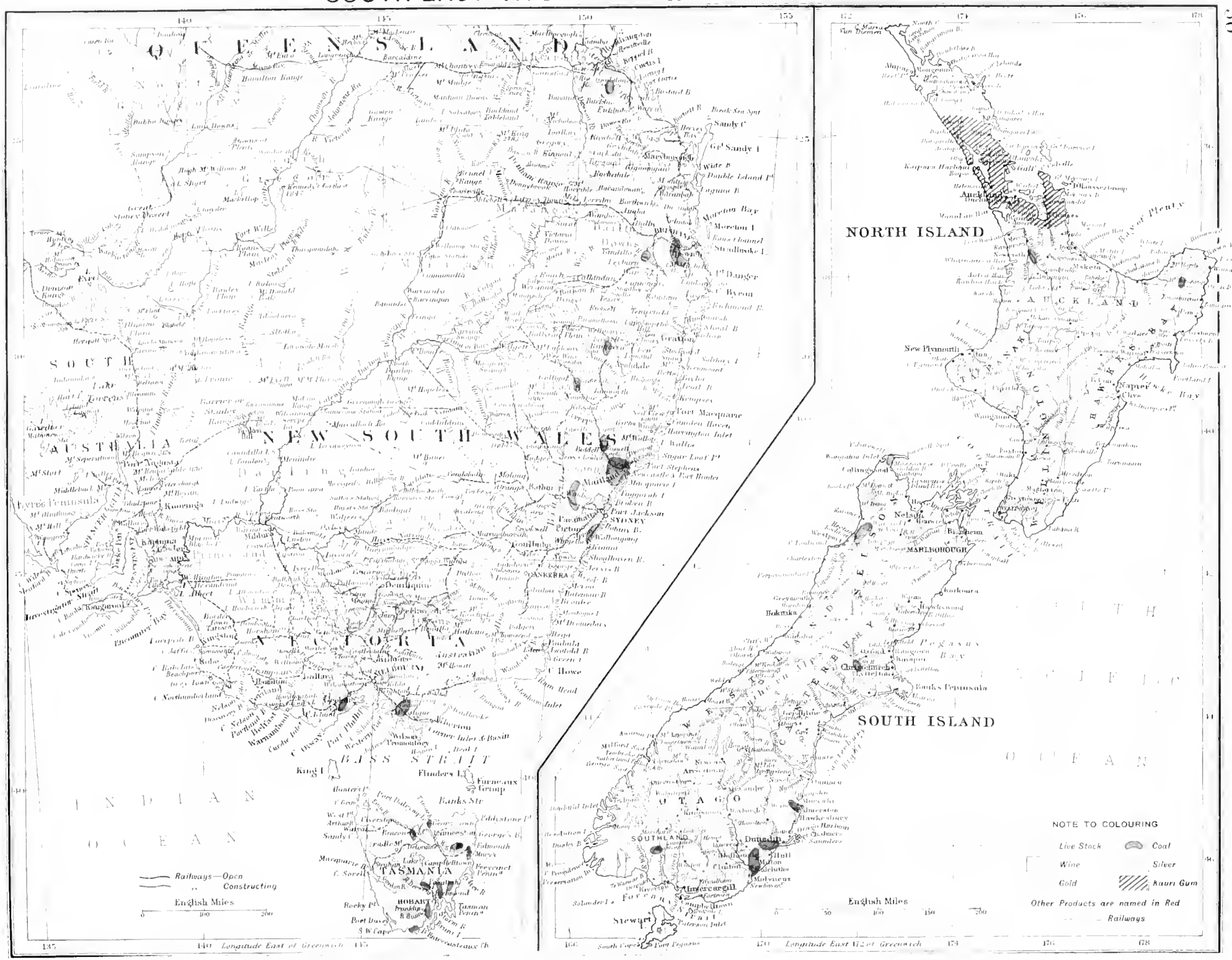
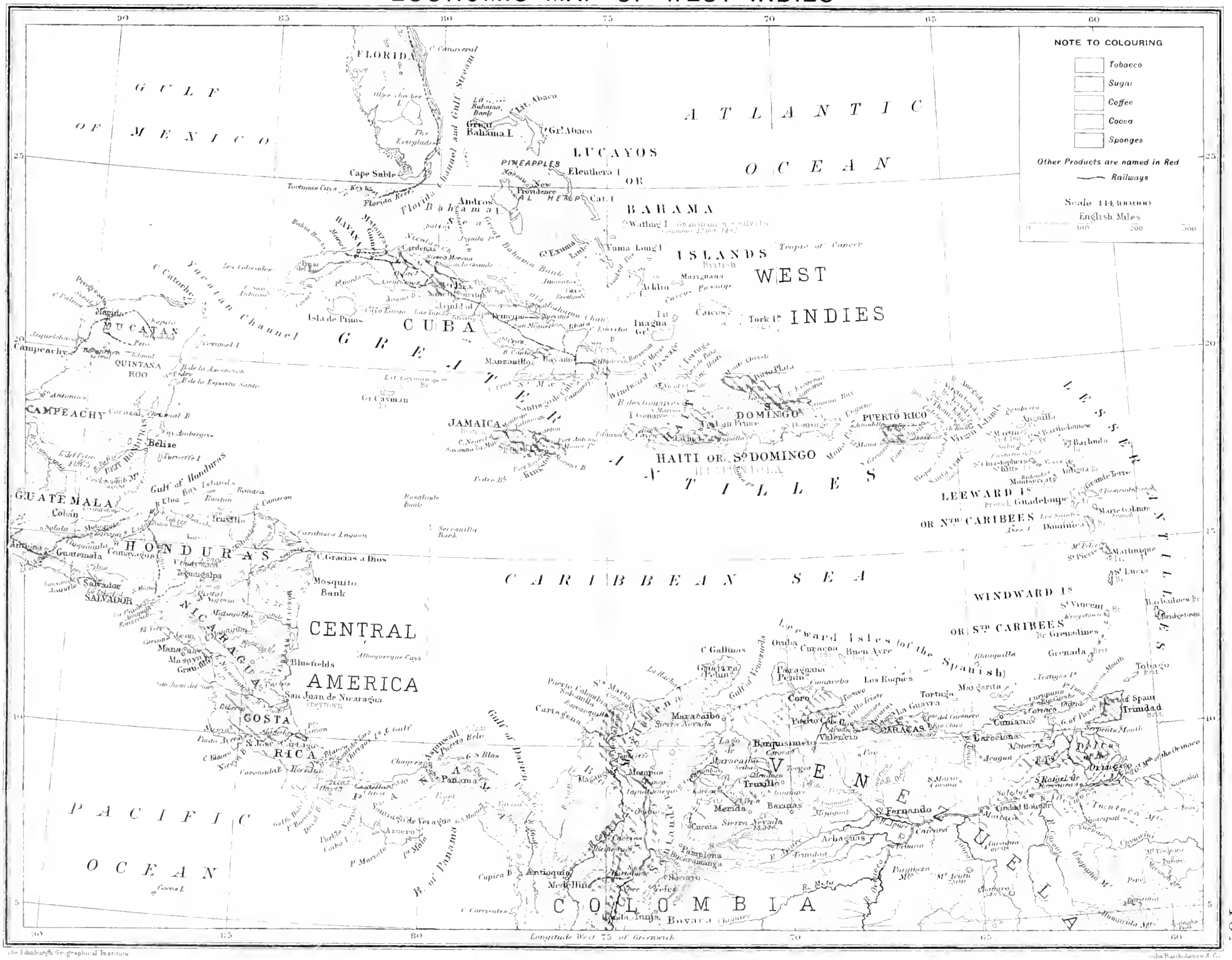
SOUTH-EAST AUSTRALIA & NEW ZEALAND



ECONOMIC MAP OF WEST INDIES



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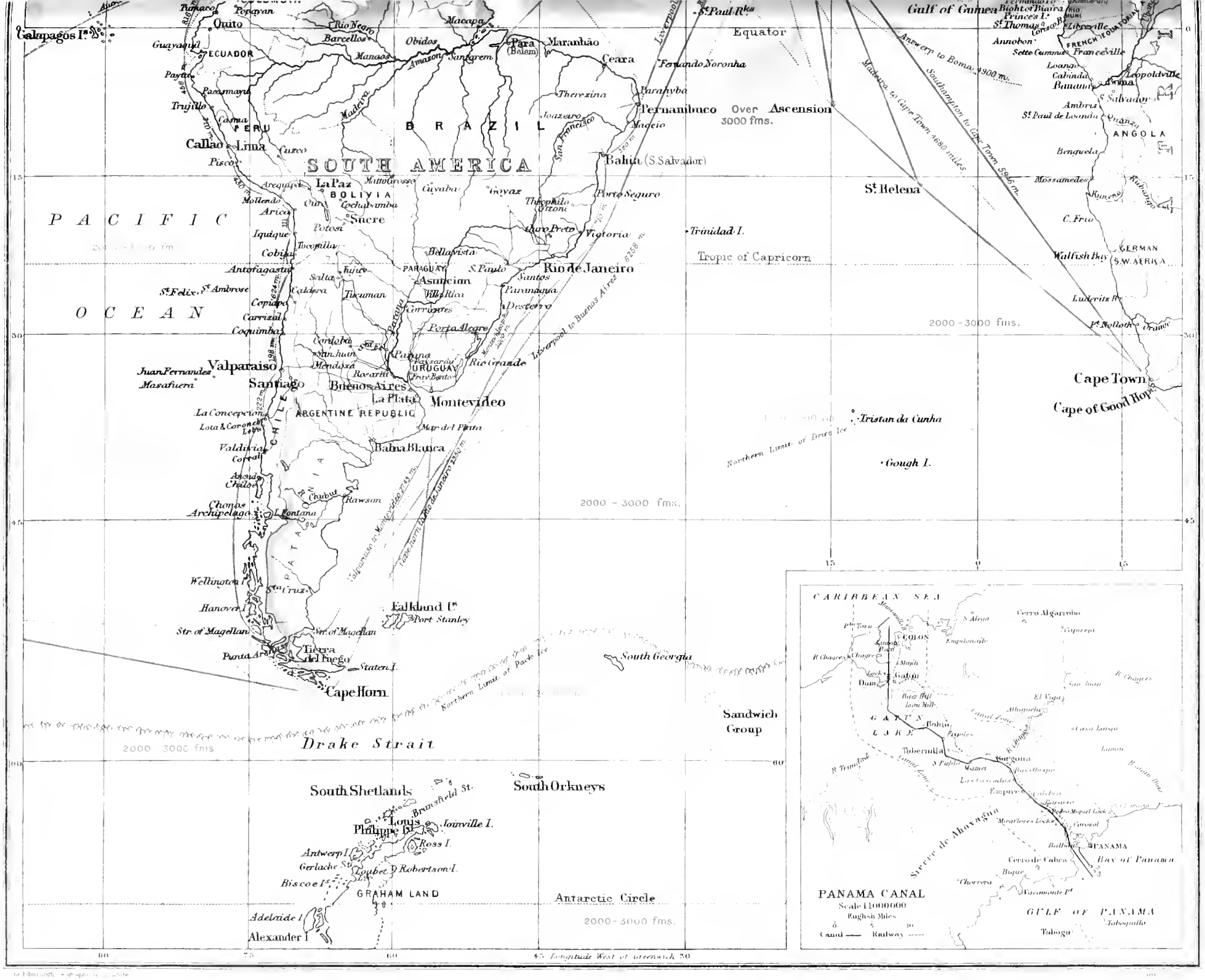
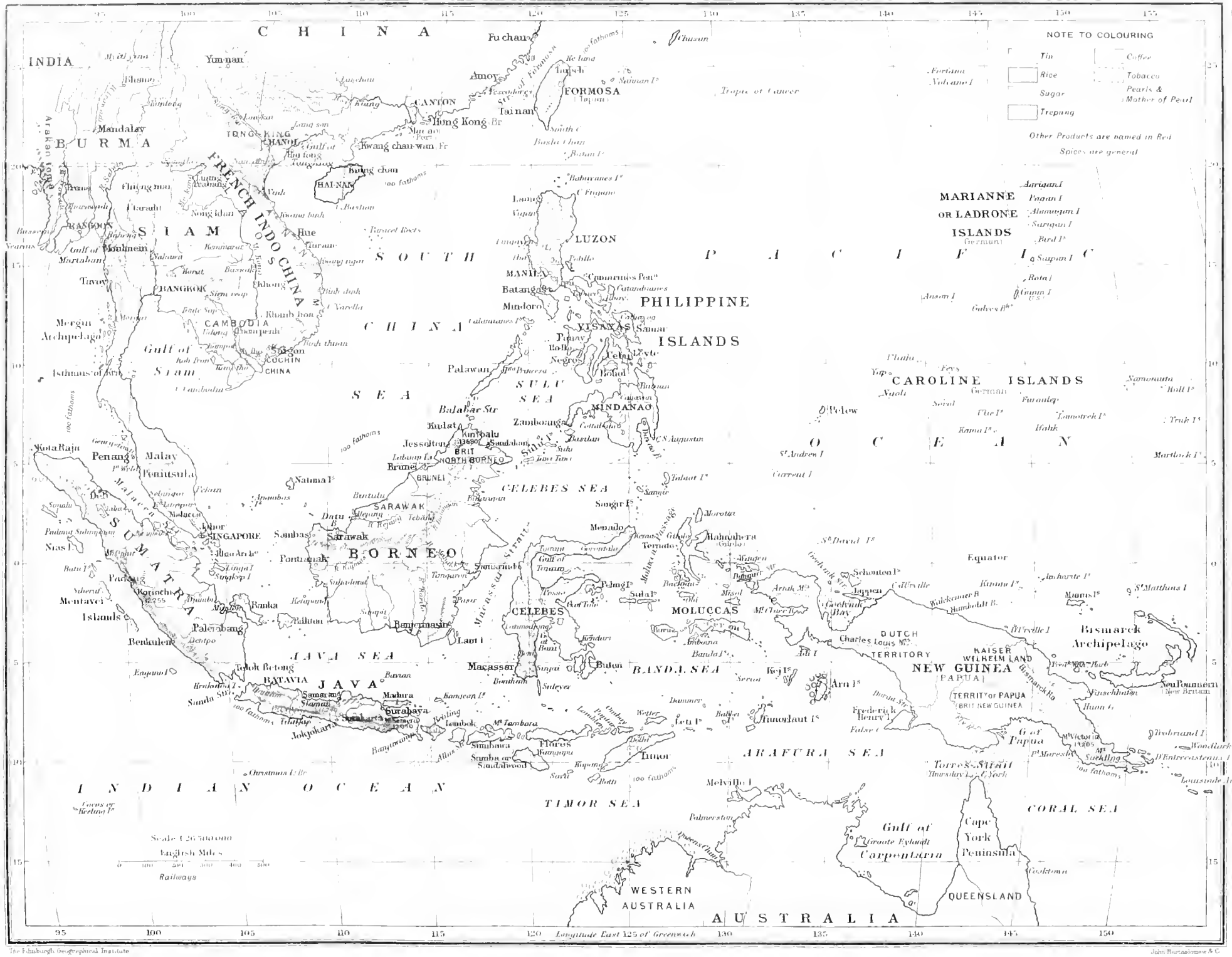
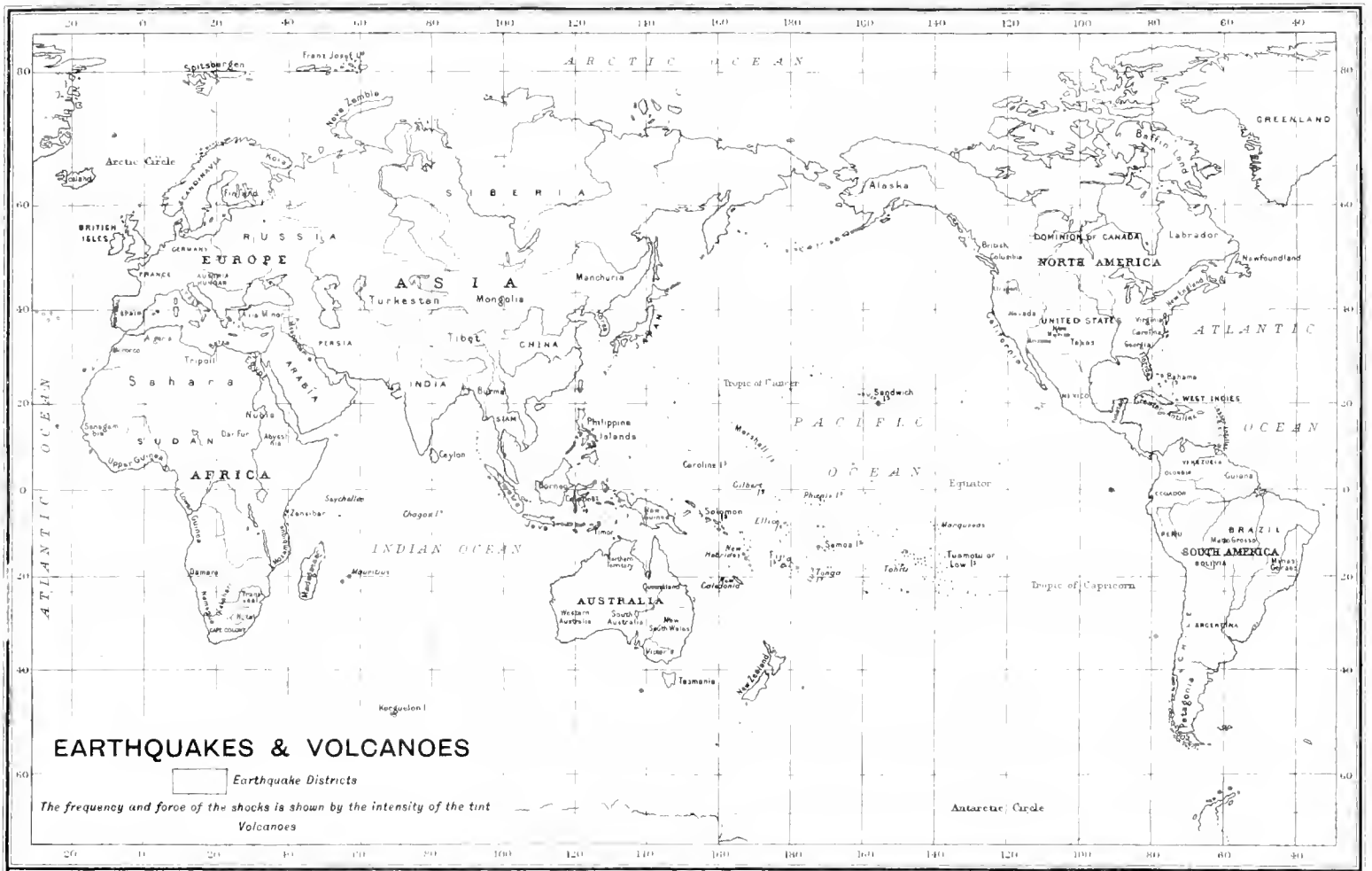
ATLANTIC OCEAN—TRADE ROUTES

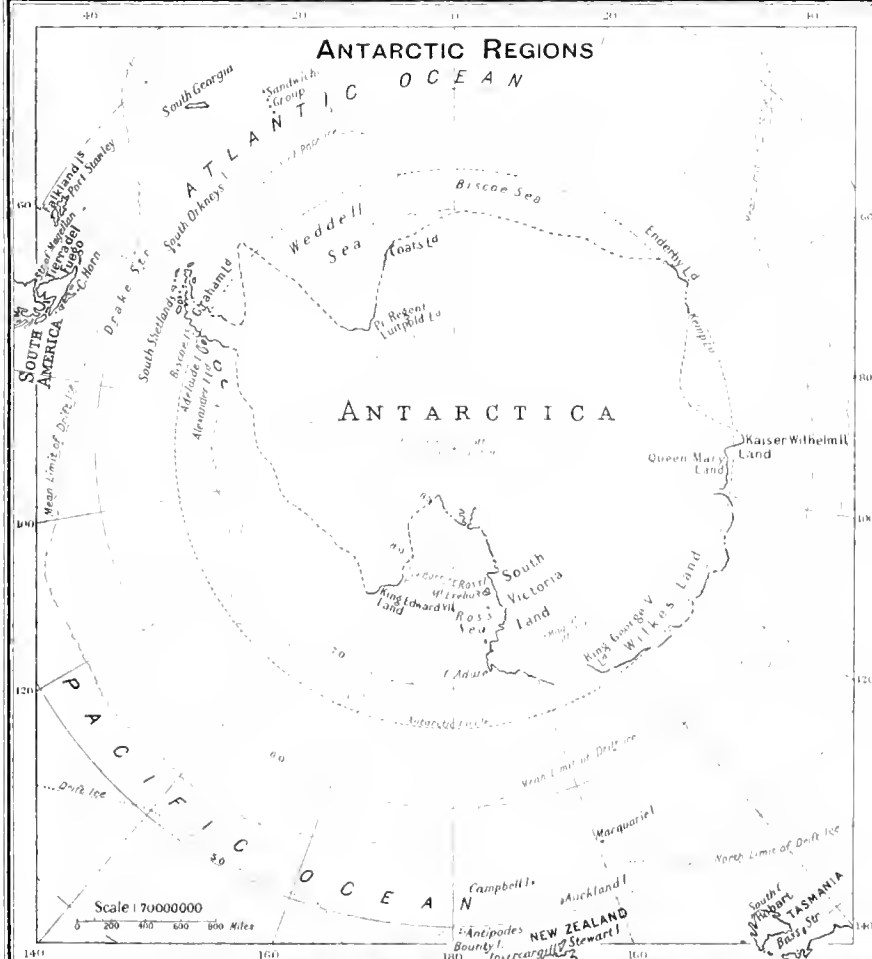
MERCATOR'S PROJECTION

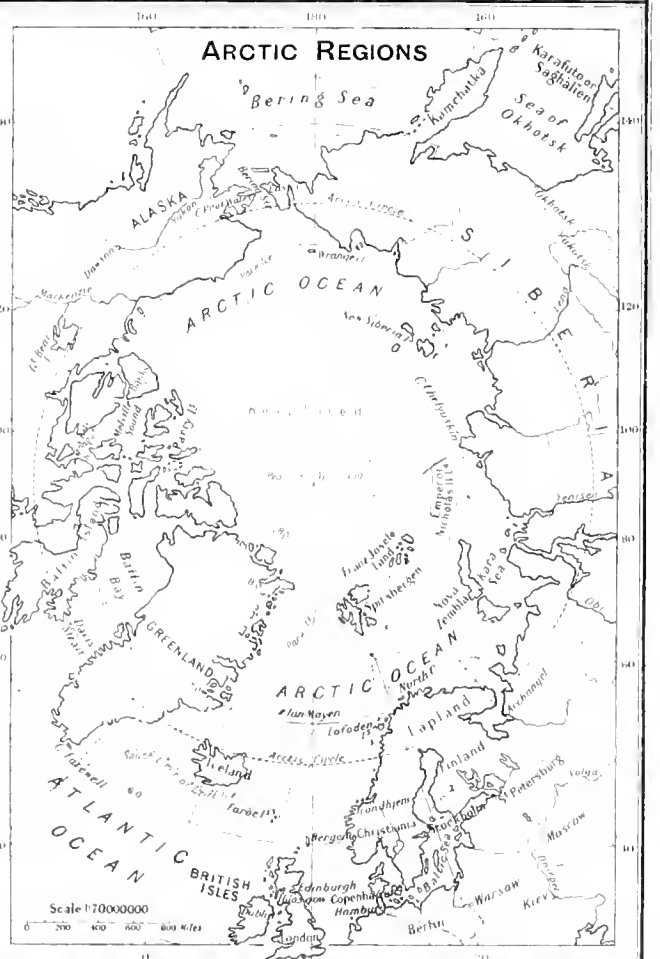

SOUTH AMERICA
BRAZIL
PERU
BOLIVIA
PARAGUAY
CHILE
ARGENTINE REPUBLIC
URUGUAY
ECUADOR
PACIFIC OCEAN
ATLANTIC OCEAN
Galapagos Is.
Quito
Guayaquil
Callao
Lima
Arequipa
La Paz
Sucre
Cochabamba
Santa Cruz
Iquique
Antofagasta
Valparaiso
Santiago
Juan Fernandez
Masafuera
St. Felix
St. Ambrose
Buenos Aires
La Plata
Montevideo
Bahia Blanca
Mar del Plata
Rio de Janeiro
Bahia (S. Salvador)
Pernambuco
Maranhão
Para (Belem)
Ceara
Fernando Noronha
Trinidad I.
Tristan da Cunha
Gough I.
St. Helena
Ascension
Over 3000 fms.
Cape Town
Cape of Good Hope
Falkland Is.
Port Stanley
Cape Horn
Tierra del Fuego
Staten I.
South Georgia
Sandwich Group
South Shetlands
South Orkneys
Drake Strait
Graham Land
Antarctic Circle
Equator
Tropic of Capricorn
2000 - 3000 fms.
Liverpool to Buenos Aires
Southampton to Cape Town 5916 m.
Madeira to Cape Town 4680 miles
Antwerp to Boma 4900 m.
Gulf of Guinea
ANGOLA
GERMAN S.W. AFRICA
PANAMA CANAL
Scale 1:1000000
English Miles
Canal
Railway
CARIBBEAN SEA
GULF OF PANAMA
PANAMA
Limits of Ocean Drainage Area
Deserts
Forests
Principal Steamship Routes
Ocean Depth Contours are drawn at intervals of 100, 1000, 2000, 3000 Fathoms

ECONOMIC MAP OF EAST INDIES









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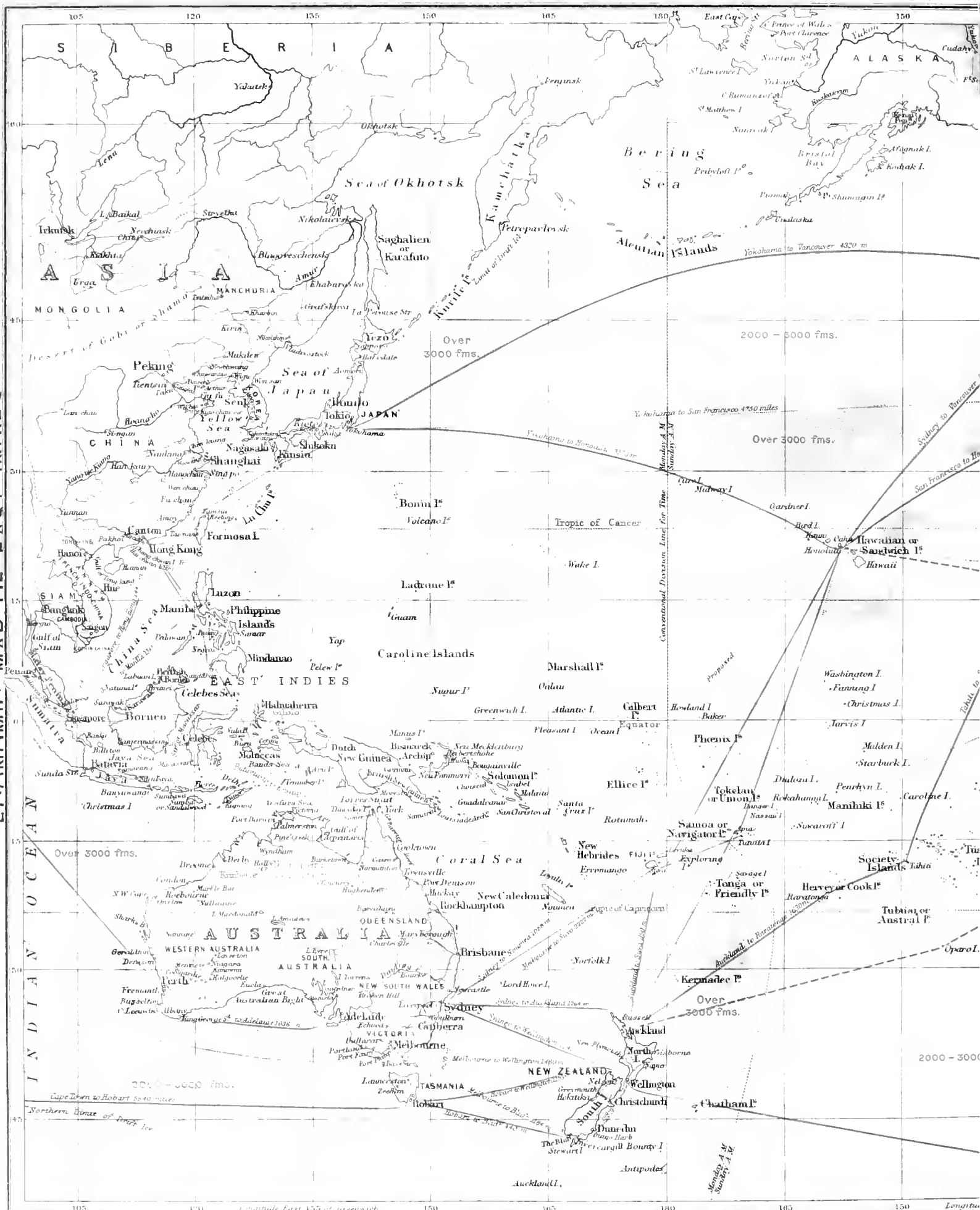
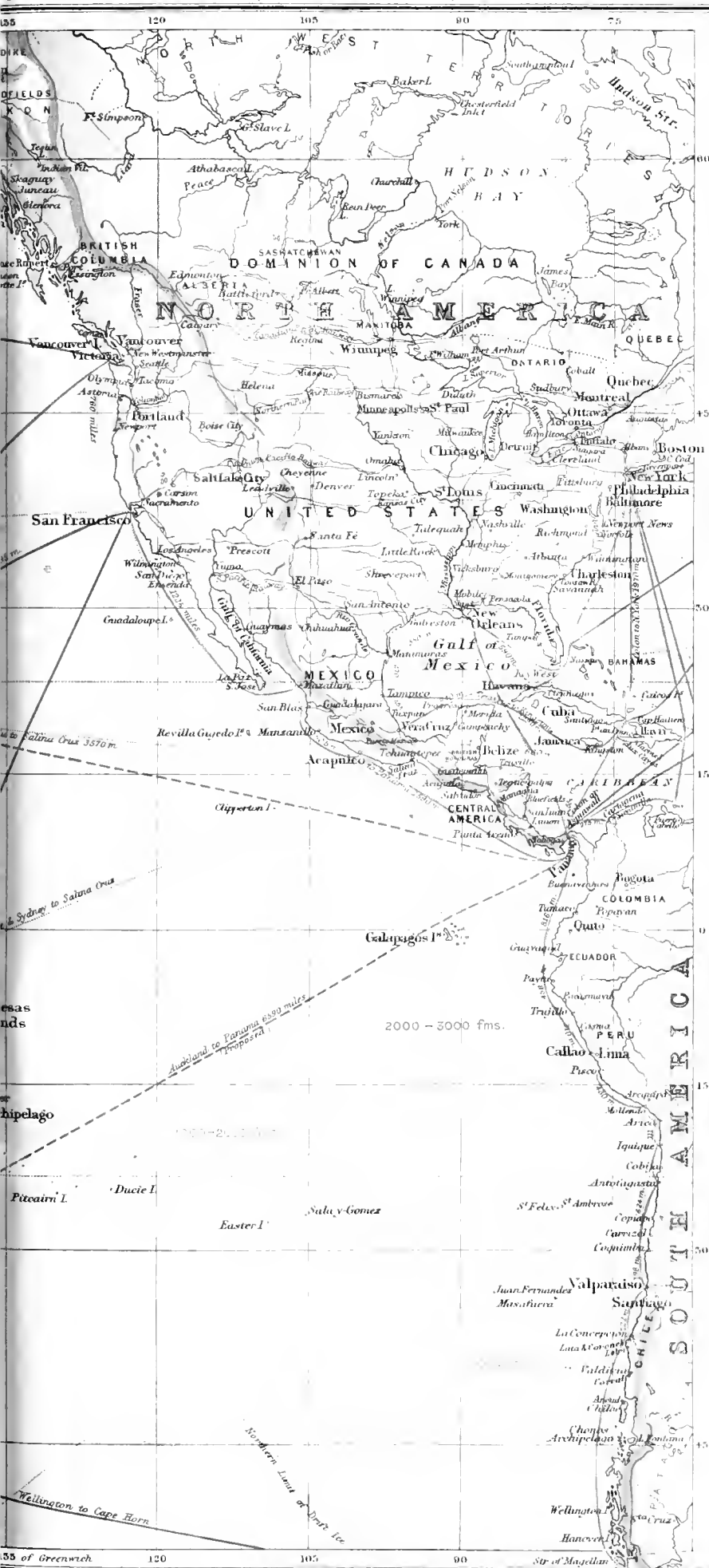
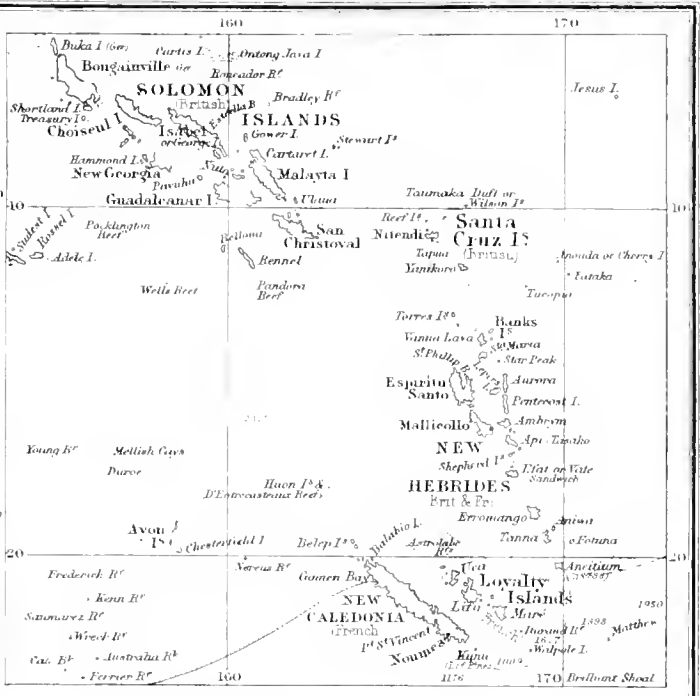
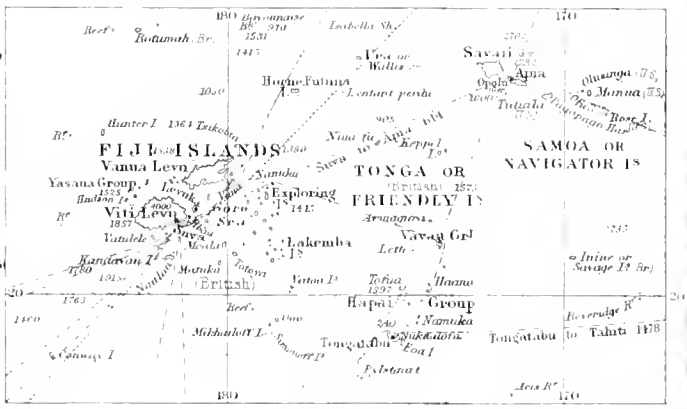
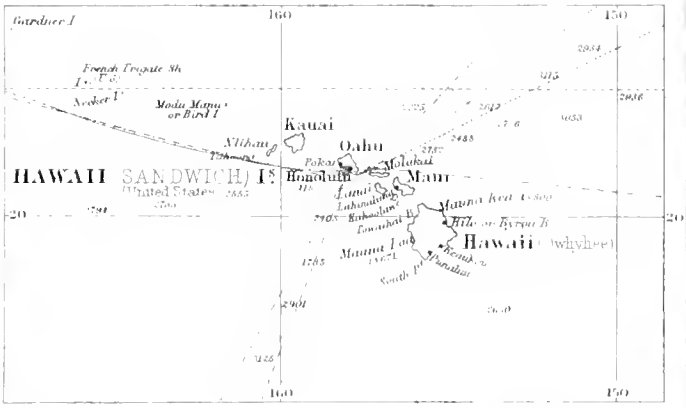
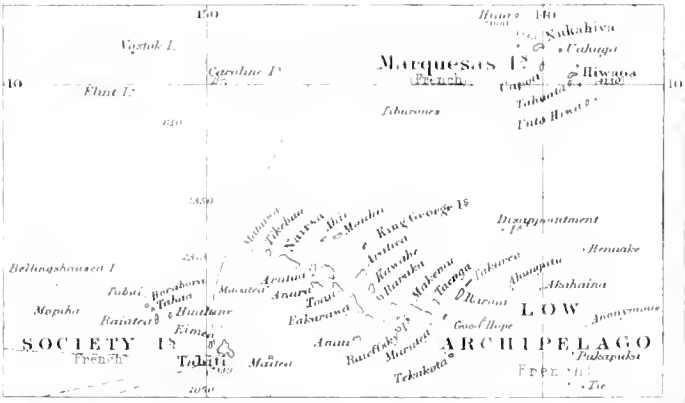

ECONOMIC MAP OF EAST INDIES
INDIAN OCEAN
105
120
135
150
165
180
165
150
SIBERIA
ASIA
ALASKA
Yakutsk
Okhotsk
Lena
L. Baikal
Irkutsk
Nerchinsk
Stanovoi Mts
Sea of Okhotsk
Kamchatka
Bering Sea
Petropavlovsk
Nikolaievsk
Saghalien or Karafuto
Aleutian Islands
Amur
Khabarovka
Blagovieschensk
MANCHURIA
MONGOLIA
Desert of Gobi or Shamo
Peking
Tientsin
Sea of Japan
Yezo
Hakodate
Yellow Sea
Seoul
Hondo
Tokio
JAPAN
Yokohama
CHINA
Nagasaki
Shikoku
Shanghai
Yangtze Kiang
Formosa I.
Canton
Hong Kong
Hanoi
SIAM
Bangkok
Luzon
Manila
Philippine Islands
Mindanao
Gulf of Siam
China Sea
Celebes Sea
EAST INDIES
Borneo
Sumatra
Celebes
Java
Batavia
Sunda Str.
Java Sea
Molucca Sea
Moluccas
Dutch New Guinea
Bismarck Archipelago
Solomon Is.
Caroline Islands
Bonin Is.
Volcano Is.
Ladrone Is.
Guam
Yap
Pelew Is.
Marshall Is.
Nugor I.
Ocean I.
Gilbert Is.
Equator
Phoenix Is.
Tropic of Cancer
Wake I.
Midway I.
Gardner I.
Hawaiian or Sandwich Is.
Hawaii
Honolulu
Conventional Division Line for Time
Yokohama to Vancouver 4320 m.
Yokohama to San Francisco 4750 miles
Sydney to Vancouver
San Francisco to Ho
Over 3000 fms.
2000 – 3000 fms.
Ellice Is.
Tokelau or Union Is.
Samoa or Navigator Is.
Rotumah
Fiji Is.
New Hebrides
Coral Sea
New Caledonia
Tonga or Friendly Is.
Society Islands
Tahiti
Hervey or Cook Is.
Rarotonga
Tubuai or Austral Is.
Manihiki Is.
Penrhyn I.
Starbuck I.
Malden I.
Caroline I.
Washington I.
Fanning I.
Christmas I.
Jarvis I.
Howland I.
Baker
Gilbert I.
Atlantic I.
Greenwich I.
Pleasant I.
Manus I.
Bismarck Archipelago
Solomon Is.
Ellice Is.
Santa Cruz I.
Guadalcanar
San Christoval
Malaita
Isabel
Choiseul
Bougainville
New Mecklenburg
Admiralty Is.
Dutch New Guinea
Torres Strait
Cape York
Thursday I.
Endeavour Str.
Great Barrier Reef
Port Darwin
Palmerston
Gulf of Carpentaria
Groote Eylandt
Wyndham
Derby
Broome
Cambridge Gulf
Roebourne
Onslow
Nickol Bay
Dampier Archipelago
Condon
Marble Bar
Yallahgoo
NW Cape
Exmouth Gulf
Shark's Bay
Geraldton
Dongara
Perth
Fremantle
Bunbury
Leeuwin
Albany
Esperance Bay
Great Australian Bight
WESTERN AUSTRALIA
SOUTH AUSTRALIA
Lake Torrens
Port Lincoln
Adelaide
Kangaroo I.
Spencer Gulf
Gulf St Vincent
Murray R.
Encounter Bay
Cape Jervis
Cape Northumberland
Portland
Port Fairy
Warrnambool
Belfast
Port Phillip Bay
Melbourne
VICTORIA
Ballarat
Echuca
Albury
Hay
Darling R.
Bourke
Wentworth
Broken Hill
Menindee
Cobar
Nyngan
Dubbo
Wellington
Orange
Bathurst
Lithgow
Katoomba
Blue Mts
Parramatta
Sydney
Port Jackson
Botany Bay
Wollongong
Jervis Bay
Canberra
Goulburn
Yass
Gundagai
Tumut
Tumbarumba
Albury
Wagga Wagga
Deniliquin
Hay
Balranald
Mildura
Swan Hill
Echuca
Shepparton
Wangaratta
Benalla
Seymour
Yea
Alexandra
Healesville
Dandenong
Geelong
Ballarat
Hamilton
Portland
Port Fairy
Warrnambool
Belfast
Port Phillip Bay
Melbourne
Williamstown
Sandridge
Footscray
Brighton
Frankston
Mornington
Queenscliff
Port Arthur
Hobart
Launceston
Zeehan
TASMANIA
Cape Town to Hobart 5840 miles
Northern limit of drift ice
Hobart to Sydney 1143 m.
Melbourne to Wellington 1480 m.
Sydney to Wellington 1264 m.
Auckland to Rarotonga 1630 m.
Auckland to Sydney 1280 m.
Norfolk I.
Lord Howe I.
Kermadec Is.
Auckland
Russell
Kaipara
Manukau
Waitemata
Hauraki Gulf
Coromandel
Tauranga
Bay of Plenty
Whakatane
Gisborne
North I.
Napier
Hawke Bay
Cape Egmont
New Plymouth
Wanganui
Foxton
Wellington
Cook Str.
Nelson
Greymouth
Hokitika
Westport
Cape Farewell
South I.
Christchurch
Lyttelton
Timaru
Oamaru
Dunedin
Otago Harb.
Taieri
Clutha R.
Invercargill
Bluff Harb.
Foveaux Str.
Stewart I.
Chatham Is.
Antipodes
Auckland Is.
NEW ZEALAND
Monday A.M. Sunday A.M.
Longitude East 135° of Greenwich
Longitude


NORTH AMERICA
SOUTH AMERICA
DOMINION OF CANADA
UNITED STATES
MEXICO
Gulf of Mexico
CENTRAL AMERICA
CARIBBEAN
HUDSON BAY
NORTH WEST TERRITORIES
BRITISH COLUMBIA
SASKATCHEWAN
ALBERTA
MANITOBA
ONTARIO
QUEBEC
COLOMBIA
ECUADOR
PERU
CHILE
BAHAMAS
Galapagos Is
Sydney to Salina Cruz
Auckland to Panama 6390 miles
Wellington to Cape Horn
Northern Limit of Drift Ice
2000 – 3000 fms.
Salina Cruz 3570 m.
Revilla Gigedo Is
Clipperton I.
Pitcairn I.
Ducie I.
Easter I.
Sala y Gomez
Juan Fernandez
Valparaiso
Santiago
Callao
Lima
Quito
Bogota
Panama
Acapulco
Mazatlan
Manzanillo
Havana
Jamaica
Belize
Vancouver
Victoria
Portland
San Francisco
Los Angeles
Salt Lake City
Chicago
Boston
New York
Philadelphia
Baltimore
Washington
Cincinnati
St Louis
New Orleans
Galveston
Charleston
Montreal
Quebec
Ottawa
Toronto
Buffalo
Detroit
Cleveland
Winnipeg
Duluth
Minneapolis
St Paul
Hudson Str.
Magellan Str.


SOLOMON ISLANDS
Bougainville I.
Choiseul I.
New Georgia
Guadalcanar I.
Malayta I.
San Christoval
Santa Cruz Is
Banks Is
Esperitu Santo
Malicollo
NEW HEBRIDES
Loyalty Islands
NEW CALEDONIA
Noumea

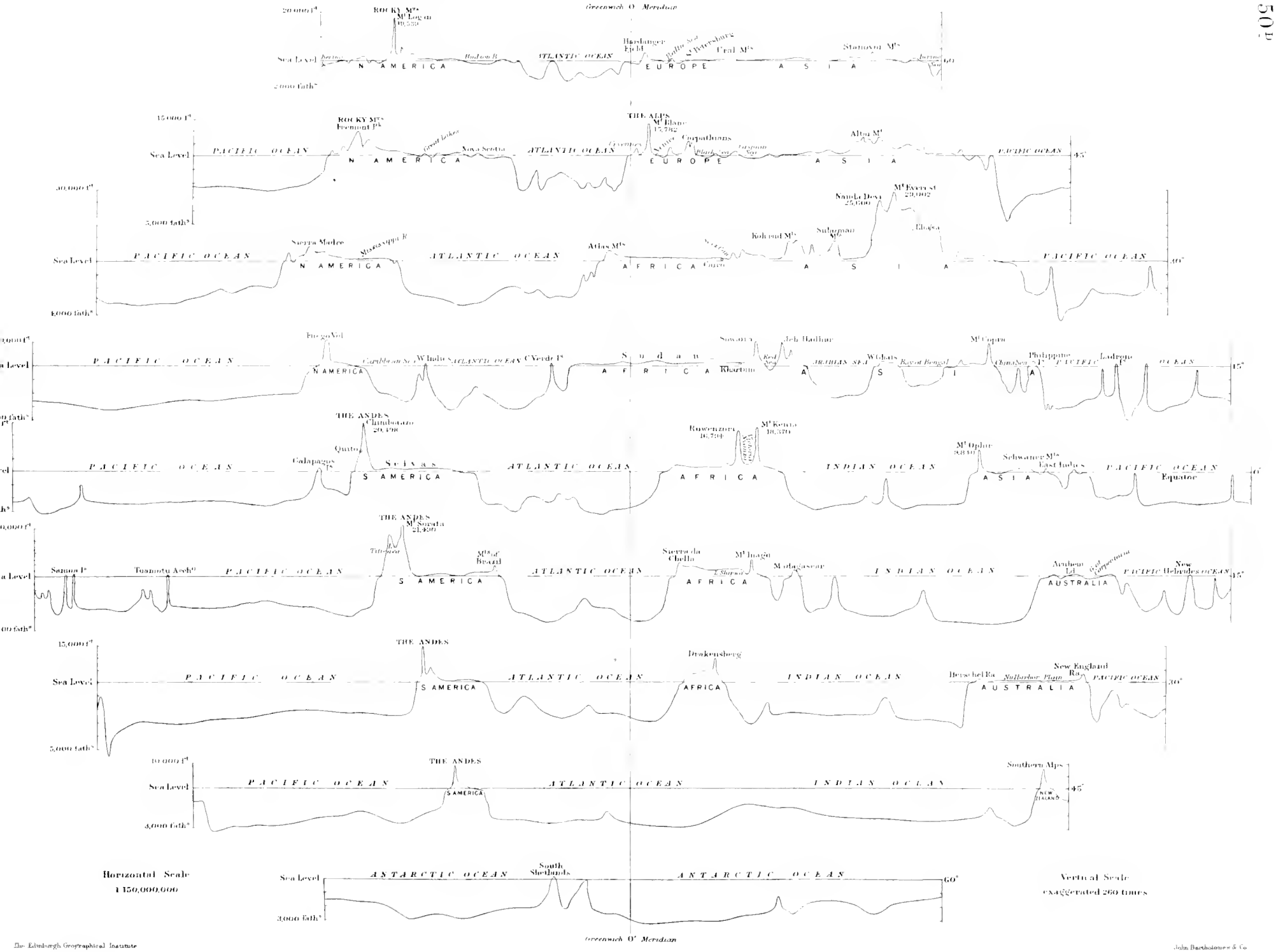

FIJI ISLANDS
Vanua Levu
Viti Levu
TONGA OR FRIENDLY Is
SAMOA OR NAVIGATOR Is
Savaii
Upolu
Apia
Hapai Group
Tongatabu
Lakemba
Exploring Is


HAWAII SANDWICH Is
Kauai
Oahu
Honolulu
Molokai
Maui
Hawaii (Whyhee)


MARQUESAS Is
SOCIETY Is
Tahiti
LOW ARCHIPELAGO

COMPARATIVE BATHY-OROGRAPHICAL SECTIONS

ALONG DIFFERENT PARALLELS OF LATITUDE ROUND THE GLOBE



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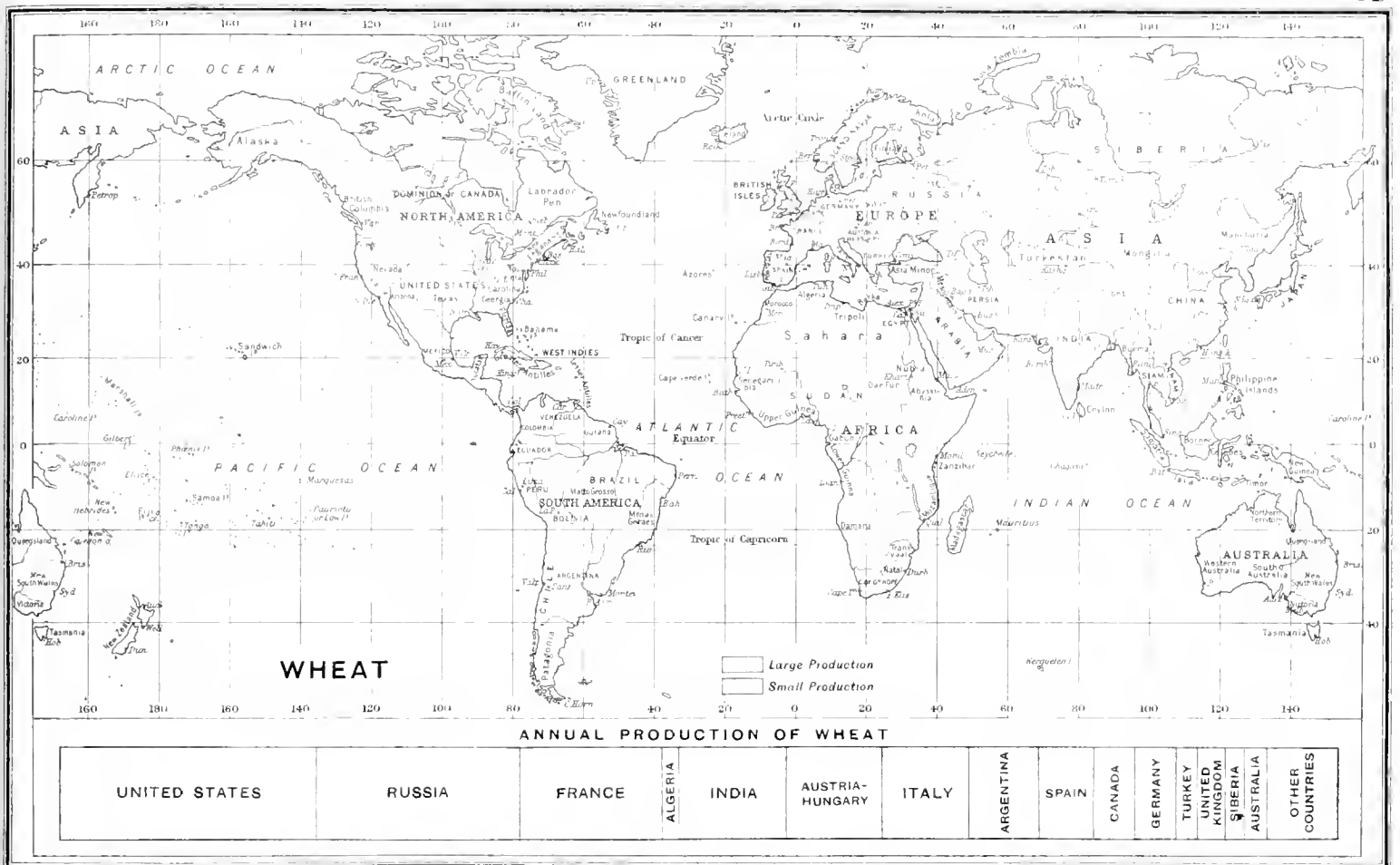
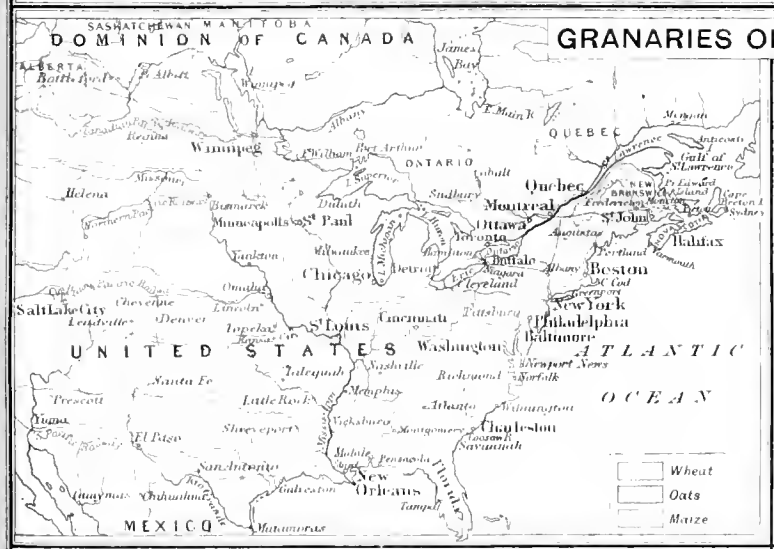
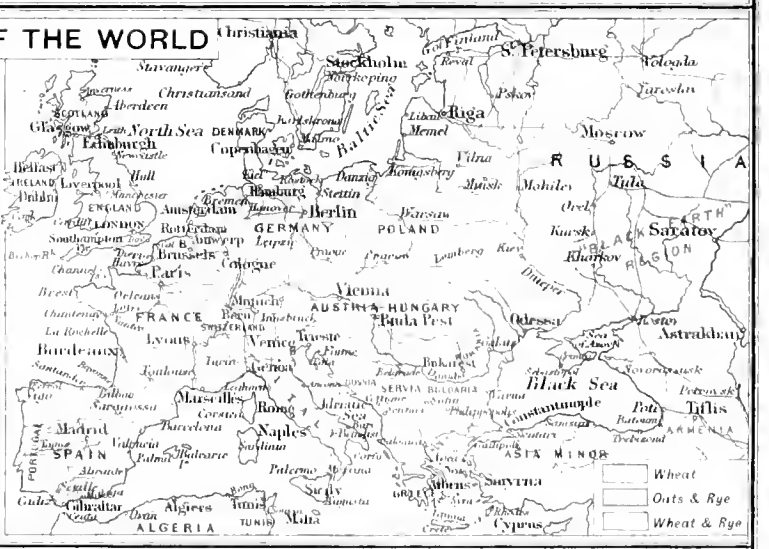


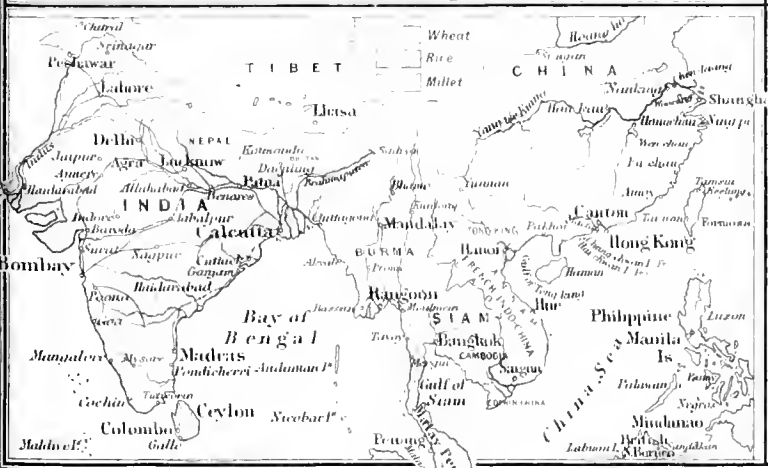
ANNUAL PRODUCTION OF WHEAT

UNITED STATES	RUSSIA	FRANCE	ALGERIA	INDIA	AUSTRIA-HUNGARY	ITALY	ARGENTINA	SPAIN	CANADA	GERMANY	TURKEY	UNITED KINGDOM	SIBERIA	AUSTRALIA	OTHER COUNTRIES

GRANARIES OF THE WORLD







CORN IMPORTS TO UNITED KINGDOM YEAR 1910

WHEAT, 119,056,000 cwts.

CANADA 20,315,000 CWTS	INDIA 17,933,000 CWTS	AUSTRALIA 13,863,000 CWTS	RUSSIA 28,947,000 CWTS	UNITED STATES 18,065,000 CWTS.	ARGENTINE 15,272,000 CWTS	OTHER COUNTRIES

N. ZEALAND

MAIZE, 37,021,000 cwts.

ARGENTINE, 19,939,000 CWTS.	UNITED STATES 5,197,000 CWT	RUMANIA 5,088,000 CWT.	BRIT. POSS	RUSSIA	OTHERS

BARLEY, 18,281,000 cwts.

RUSSIA, 9,233,000 CWTS	RUMANIA 2,901,000 CWT.	UNITED STATES	TURKEY	BRIT. POSS	OTHER COUNTRIES

OATS, 17,495,000 cwts.

RUSSIA, 8,099,000 CWTS	ARGENTINE 4,232,000 CWT	GERMANY	BRIT. POSS	OTHERS

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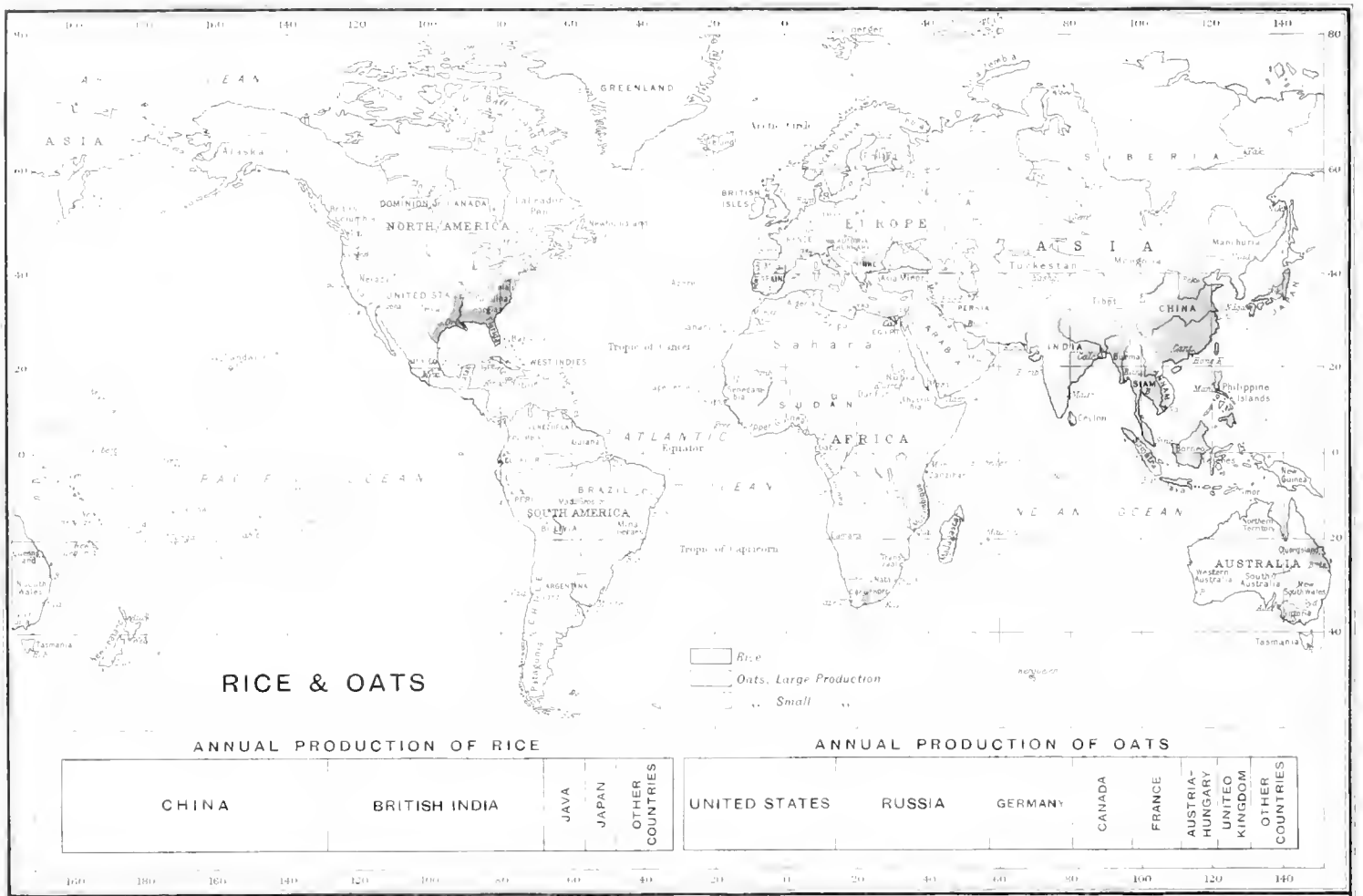


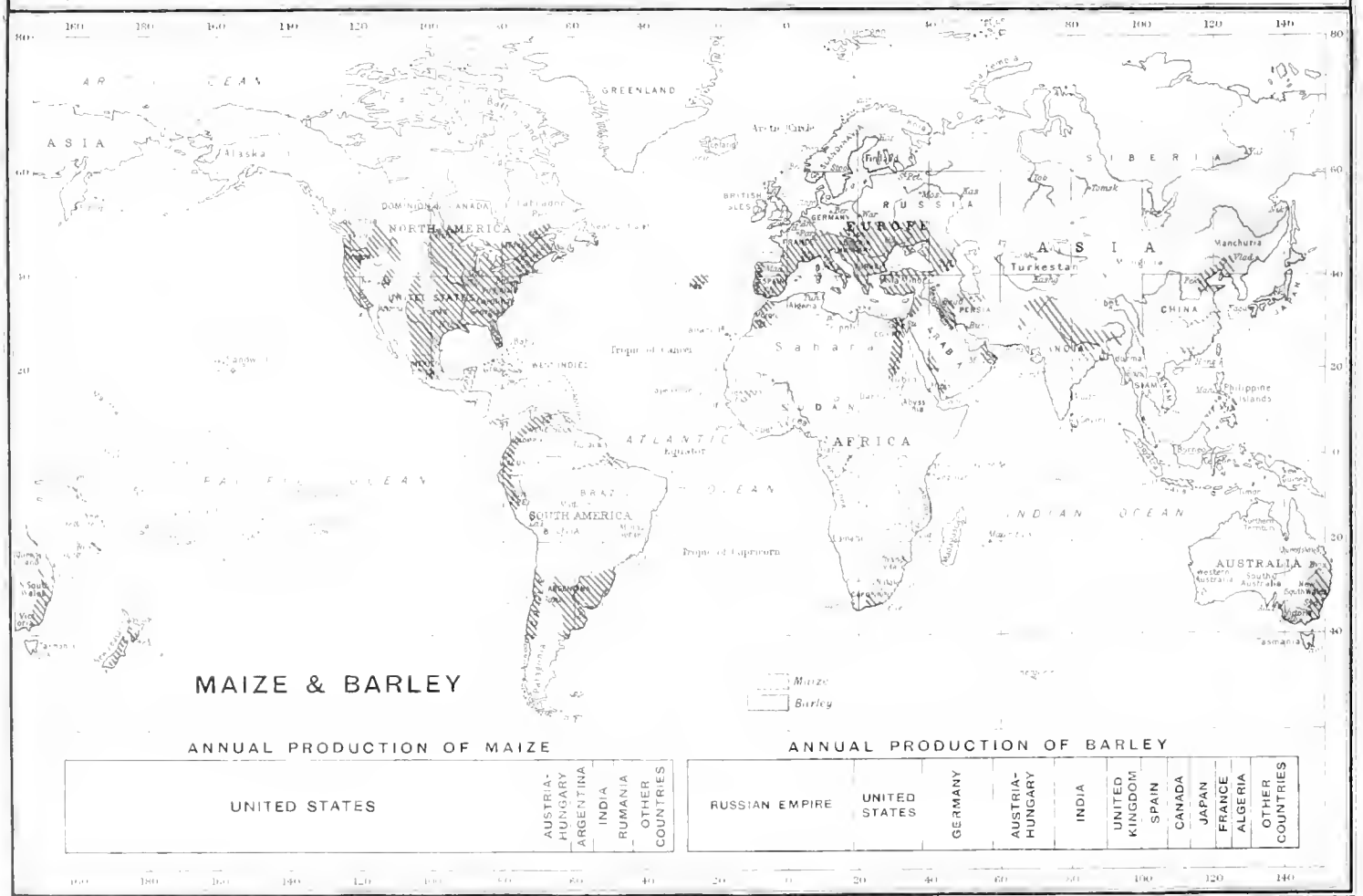
RICE & OATS

ANNUAL PRODUCTION OF RICE

CHINA	BRITISH INDIA	JAVA	JAPAN	OTHER COUNTRIES

ANNUAL PRODUCTION OF OATS

UNITED STATES	RUSSIA	GERMANY	CANADA	FRANCE	AUSTRIA-HUNGARY	UNITED KINGDOM	OTHER COUNTRIES



MAIZE & BARLEY

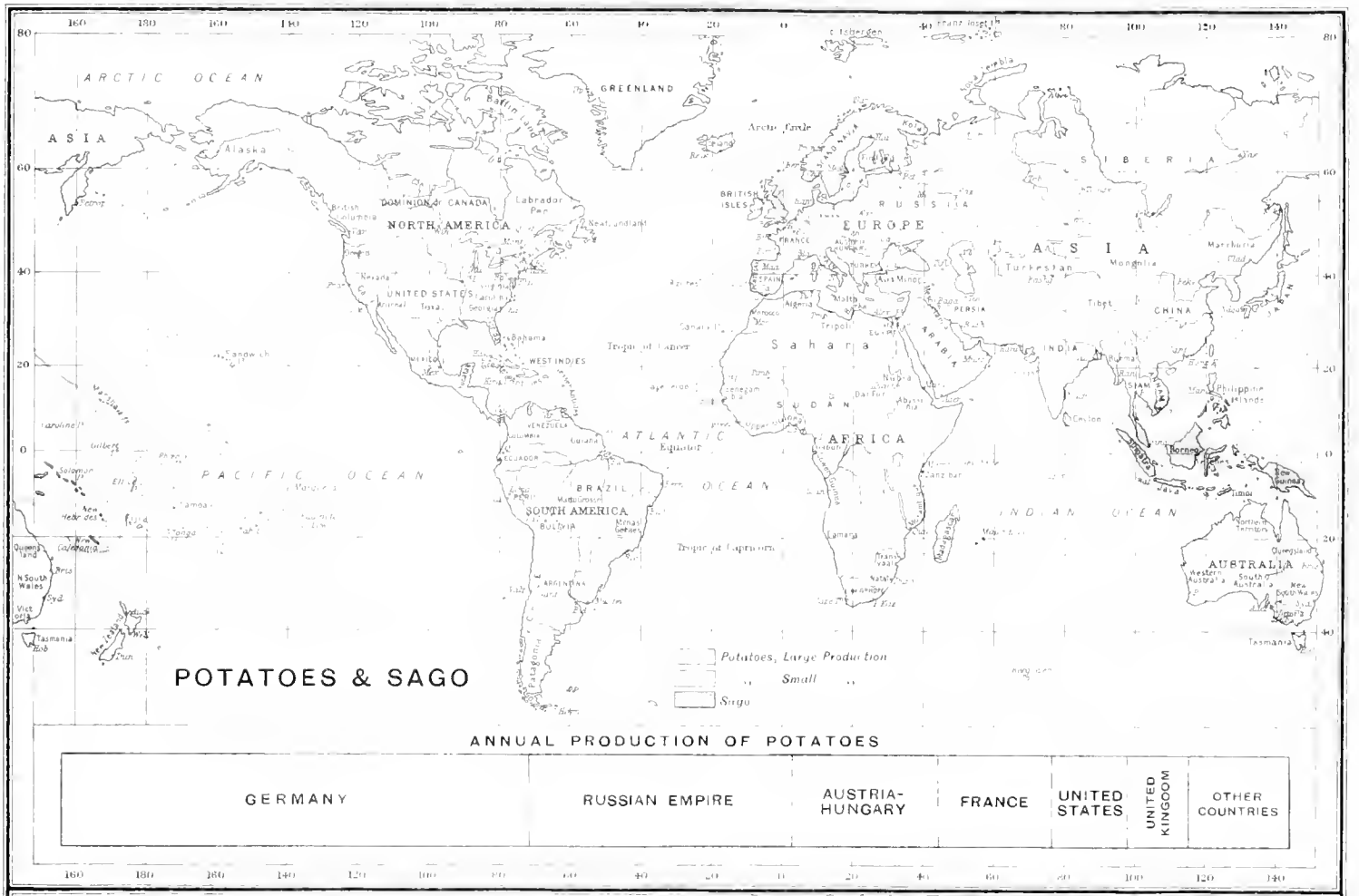
ANNUAL PRODUCTION OF MAIZE

UNITED STATES	AUSTRIA-HUNGARY	ARGENTINA	INDIA	RUMANIA	OTHER COUNTRIES

ANNUAL PRODUCTION OF BARLEY

RUSSIAN EMPIRE	UNITED STATES	GERMANY	AUSTRIA-HUNGARY	INDIA	UNITED KINGDOM	SPAIN	CANADA	JAPAN	FRANCE	ALGERIA	OTHER COUNTRIES

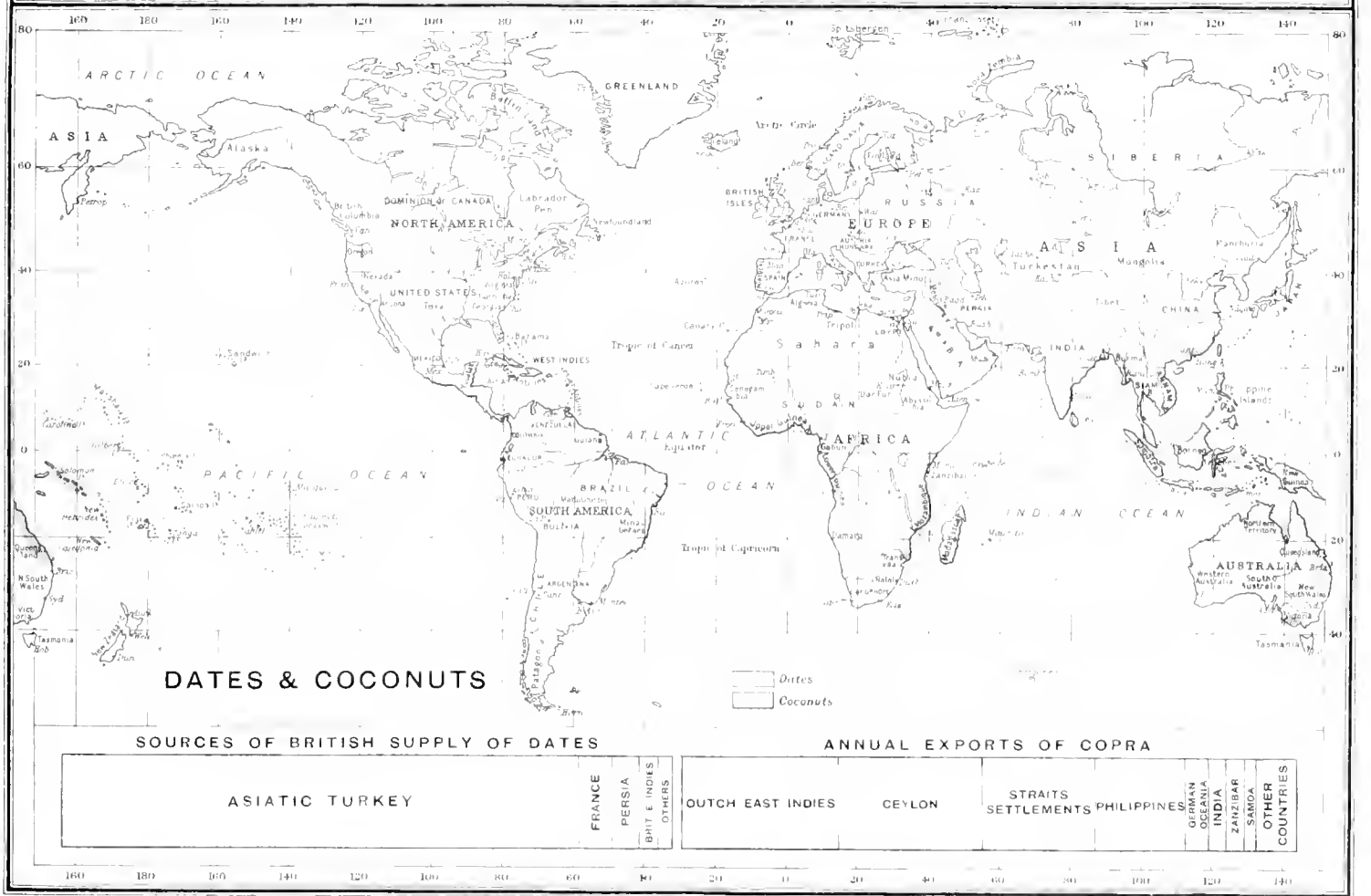
John Bartholomew & Co



POTATOES & SAGO

ANNUAL PRODUCTION OF POTATOES

GERMANY	RUSSIAN EMPIRE	AUSTRIA-HUNGARY	FRANCE	UNITED STATES	UNITED KINGDOM	OTHER COUNTRIES



DATES & COCONUTS

SOURCES OF BRITISH SUPPLY OF DATES

ASIATIC TURKEY	FRANCE	PERSIA	BRIT E INDIES	OTHERS

ANNUAL EXPORTS OF COPRA

DUTCH EAST INDIES	CEYLON	STRAITS SETTLEMENTS	PHILIPPINES	GERMAN OCEANIA	INDIA	ZANZIBAR	SAMOA	OTHER COUNTRIES

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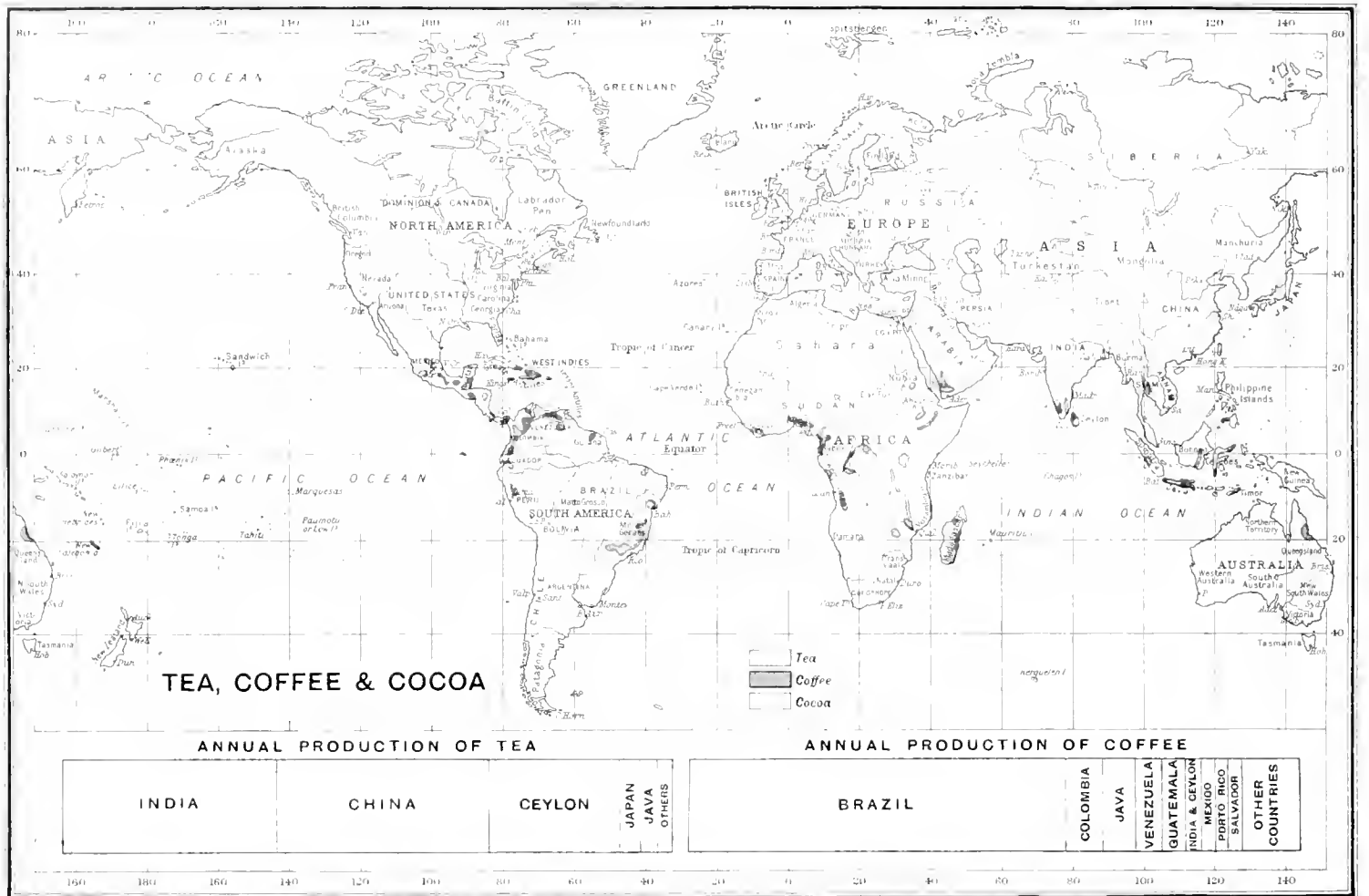
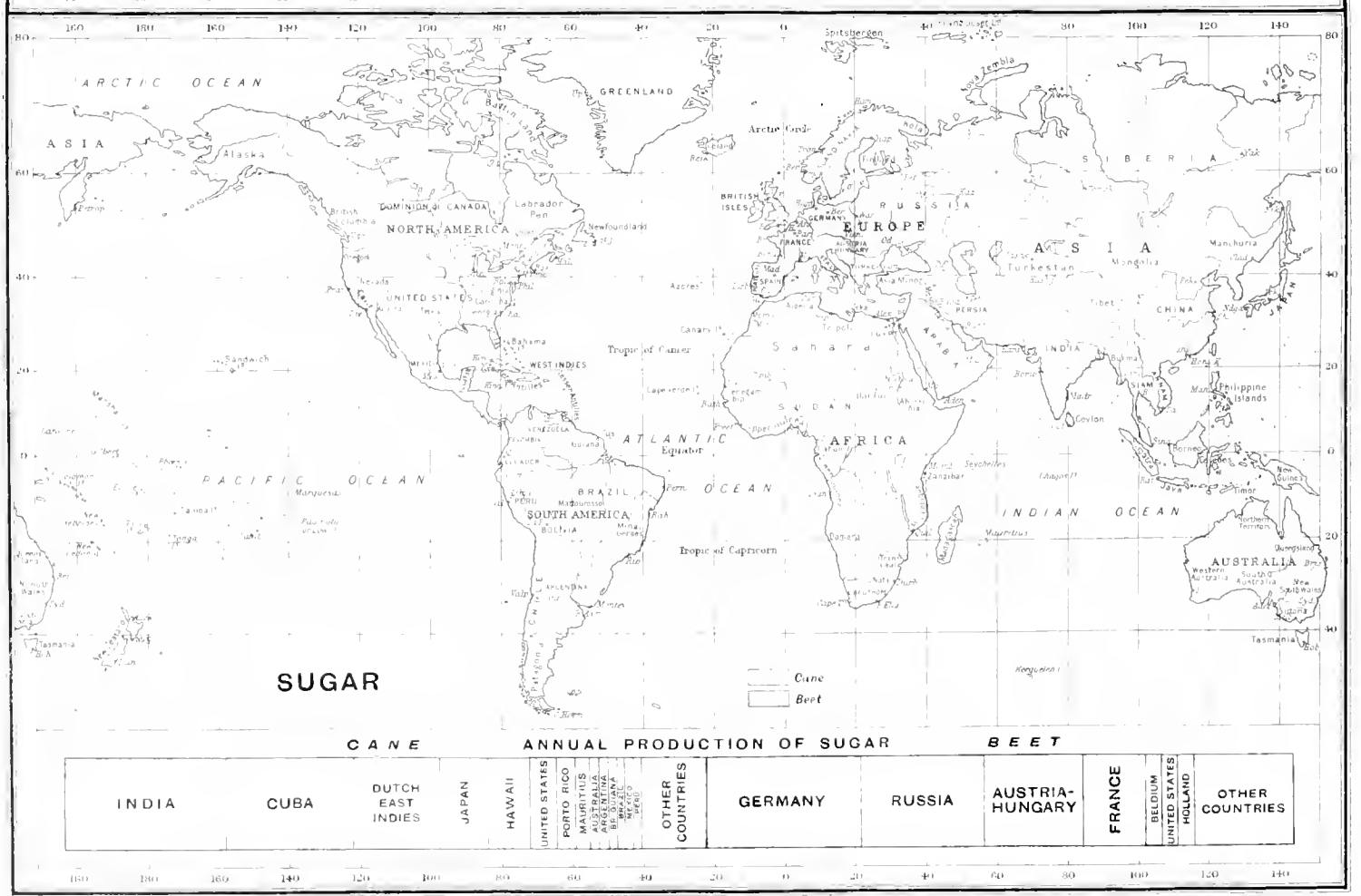
COMPARATIVE BATHY-OROGRAPHICAL SECTIONS





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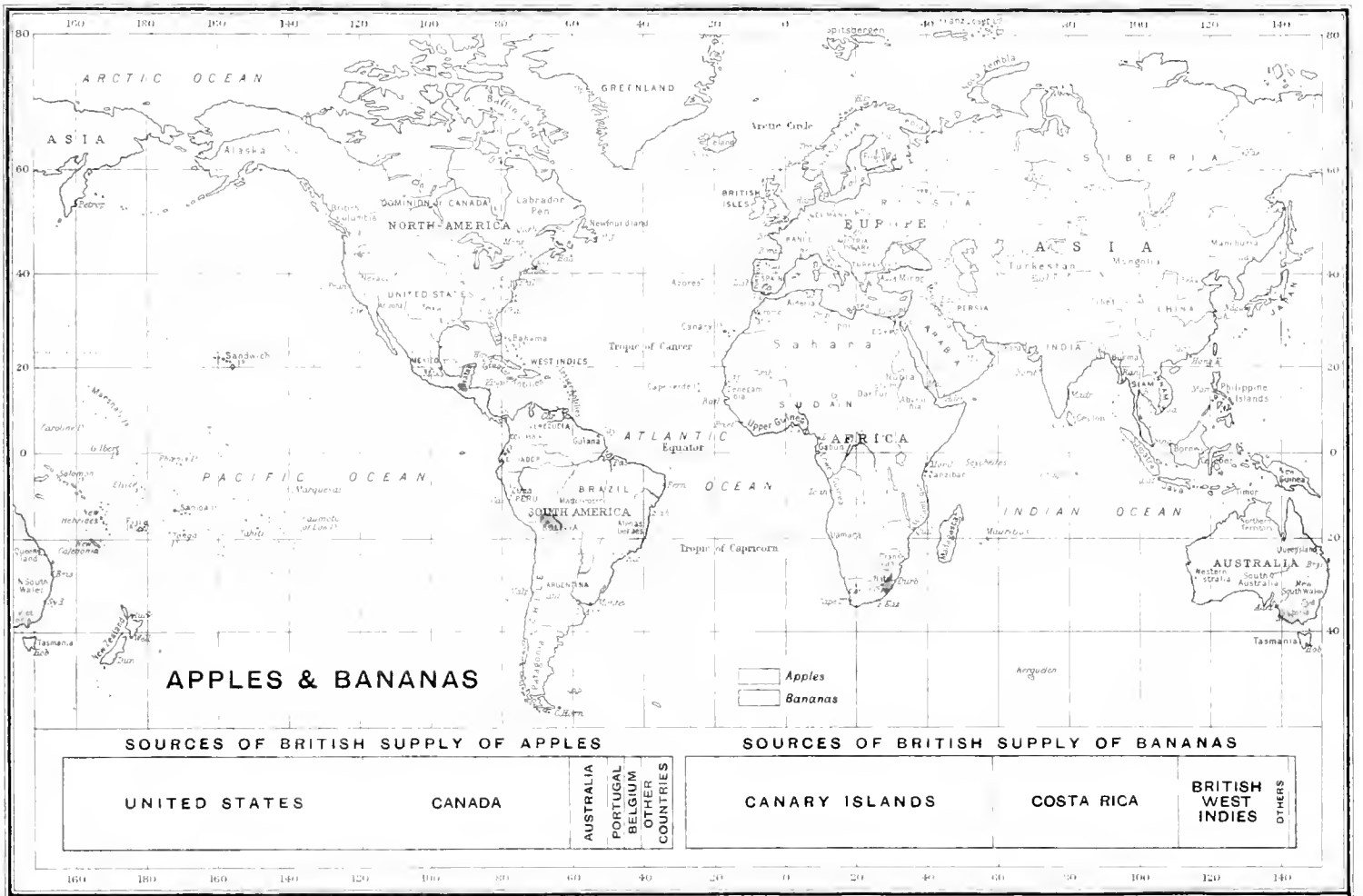
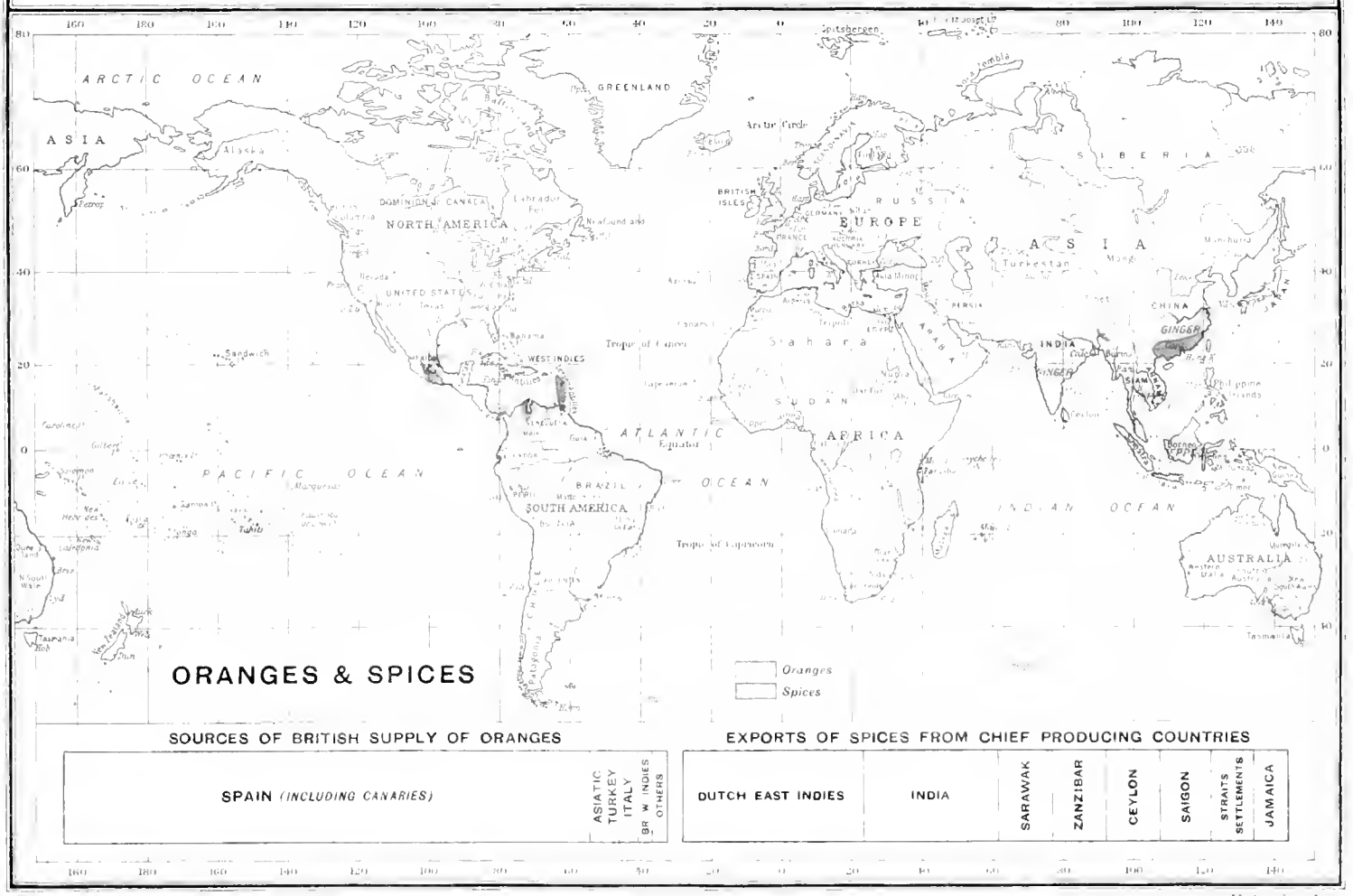

ARCTIC OCEAN
ASIA
GREENLAND
Arctic Circle
Alaska
DOMINION OF CANADA
NORTH AMERICA
Labrador Pen.
Newfoundland
BRITISH ISLES
EUROPE
RUSSIA
SIBERIA
ASIA
Turkestan
Mongolia
Manchuria
UNITED STATES
Azores
PERSIA
CHINA
Bahama
Tropic of Cancer
Canary Is.
Sahara
INDIA
WEST INDIES
Sandwich
SUDAN
Upper Guinea
ATLANTIC
Equator
AFRICA
PACIFIC OCEAN
BRAZIL
SOUTH AMERICA
INDIAN OCEAN
Tropic of Capricorn
AUSTRALIA
ARGENTINA
Tasmania
APPLES & BANANAS
Apples
Bananas
SOURCES OF BRITISH SUPPLY OF APPLES
UNITED STATES
CANADA
AUSTRALIA
PORTUGAL
BELGIUM
OTHER COUNTRIES
SOURCES OF BRITISH SUPPLY OF BANANAS
CANARY ISLANDS
COSTA RICA
BRITISH WEST INDIES
OTHERS


ARCTIC OCEAN
ASIA
GREENLAND
Arctic Circle
Alaska
DOMINION OF CANADA
NORTH AMERICA
Labrador Pen.
Newfoundland
BRITISH ISLES
EUROPE
RUSSIA
SIBERIA
ASIA
Turkestan
Manchuria
UNITED STATES
Azores
PERSIA
CHINA
GINGER
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Canary Is.
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INDIA
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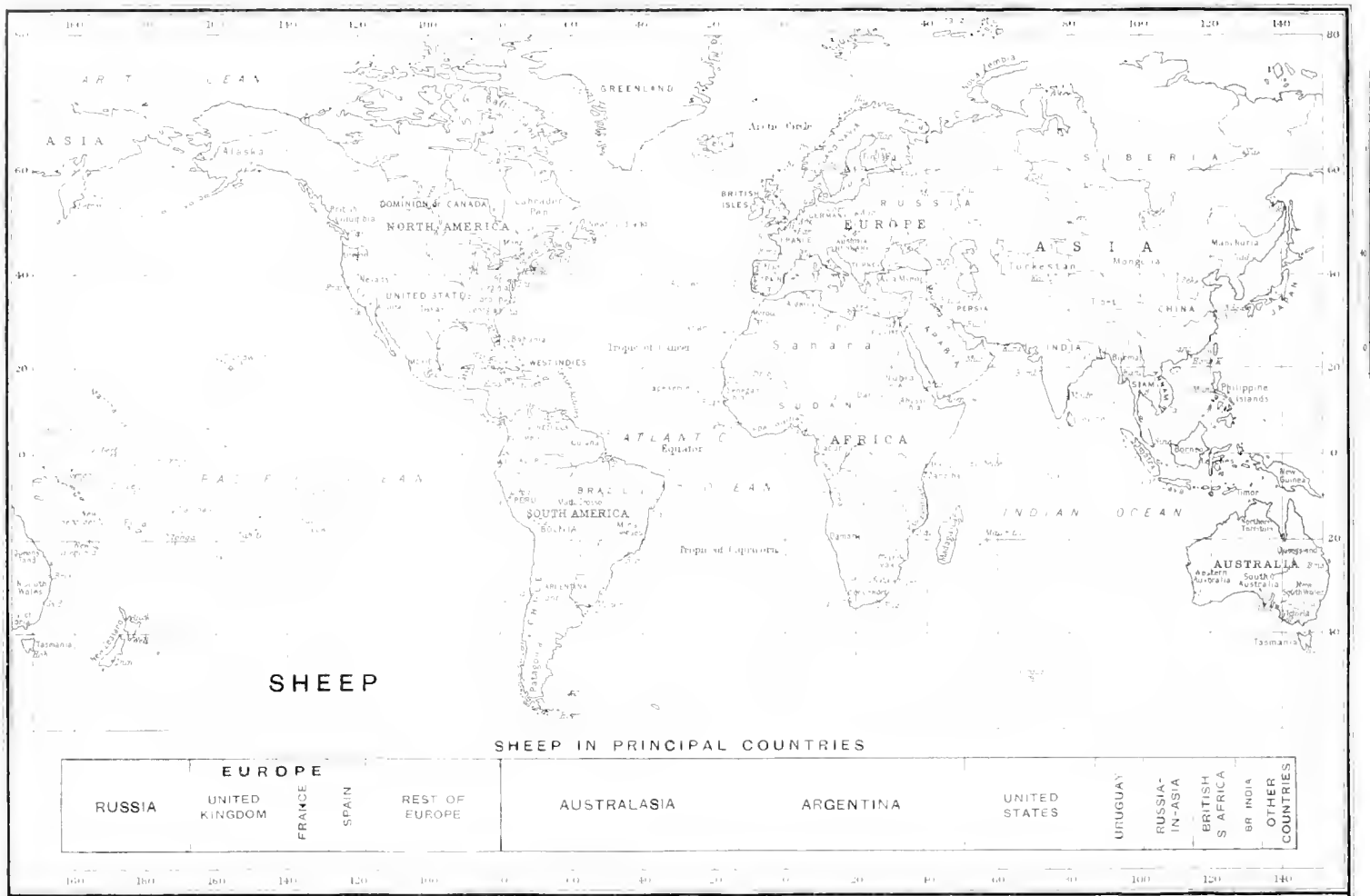
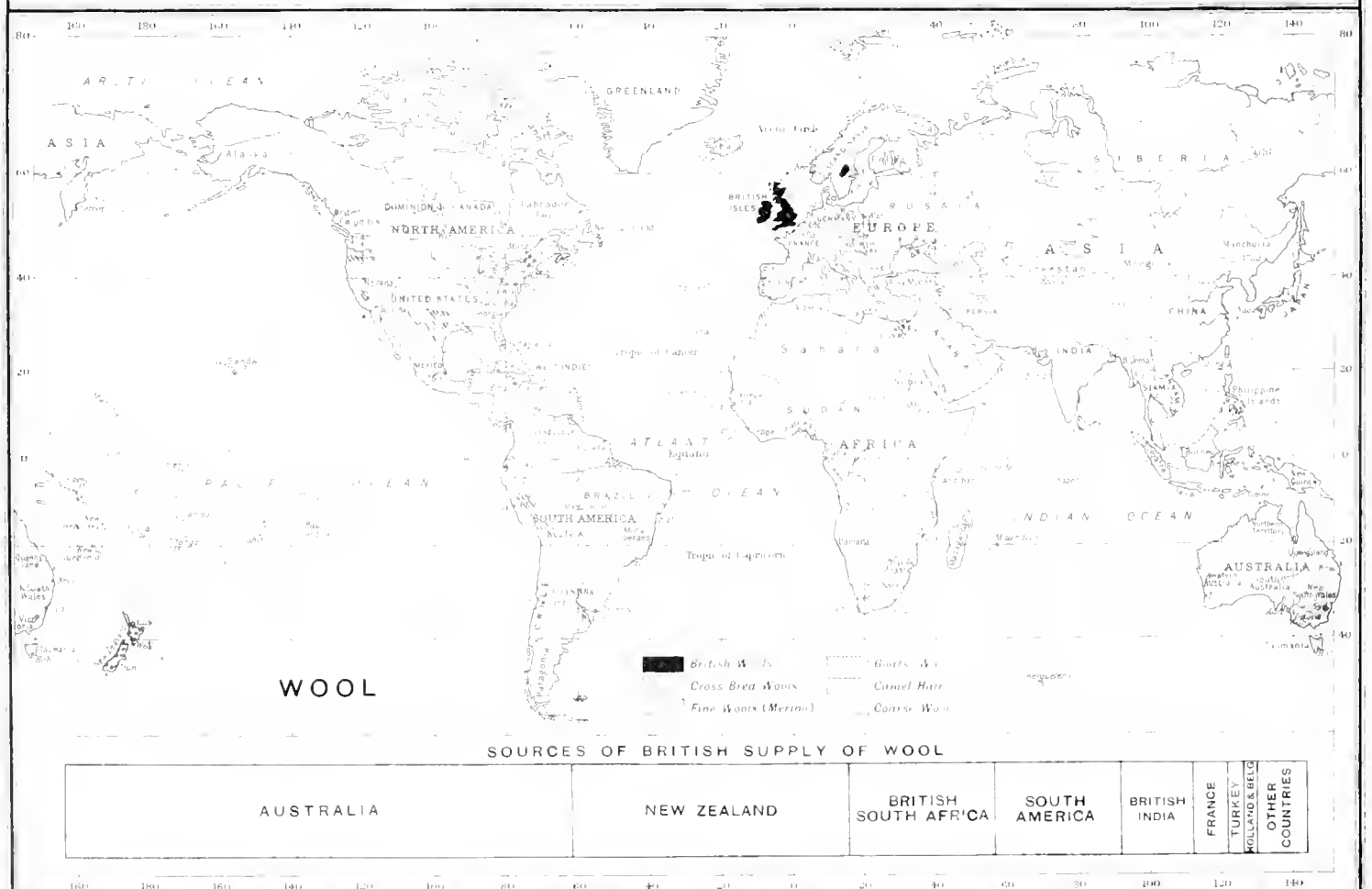
Sandwich
SUDAN
ATLANTIC
Equator
AFRICA
PACIFIC OCEAN
BRAZIL
SOUTH AMERICA
INDIAN OCEAN
Tropic of Capricorn
AUSTRALIA
ARGENTINA
Tasmania
ORANGES & SPICES
Oranges
Spices
SOURCES OF BRITISH SUPPLY OF ORANGES
SPAIN (INCLUDING CANARIES)
ASIATIC TURKEY
ITALY
BR W INDIES
OTHERS
EXPORTS OF SPICES FROM CHIEF PRODUCING COUNTRIES
DUTCH EAST INDIES
INDIA
SARAWAK
ZANZIBAR
CEYLON
SAIGON
STRAITS SETTLEMENTS
JAMAICA



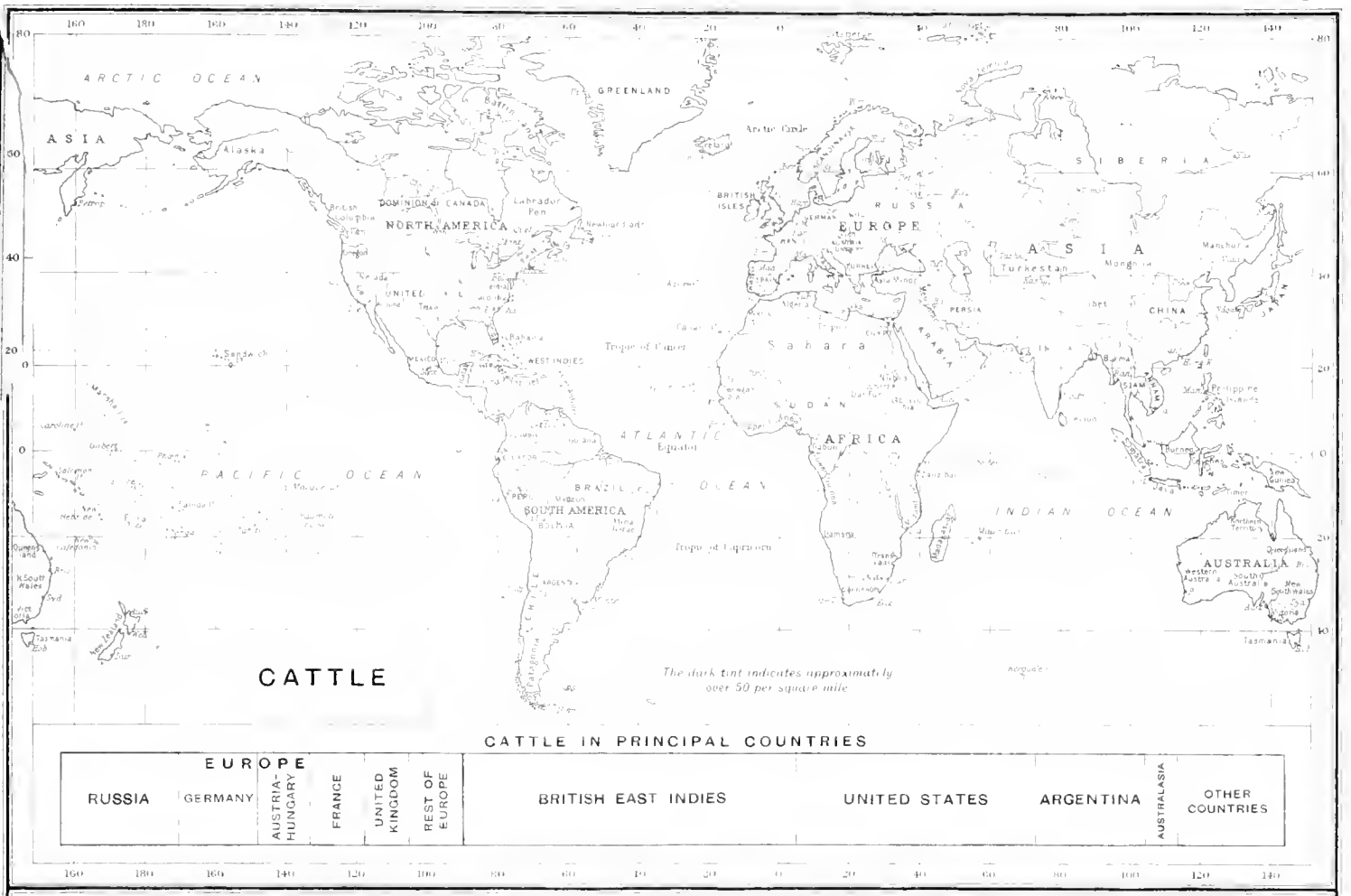
SHEEP IN PRINCIPAL COUNTRIES

EUROPE												
RUSSIA	UNITED KINGDOM	FRANCE	SPAIN	REST OF EUROPE	AUSTRALASIA	ARGENTINA	UNITED STATES	URUGUAY	RUSSIA-IN-ASIA	BRITISH S. AFRICA	BR. INDIA	OTHER COUNTRIES



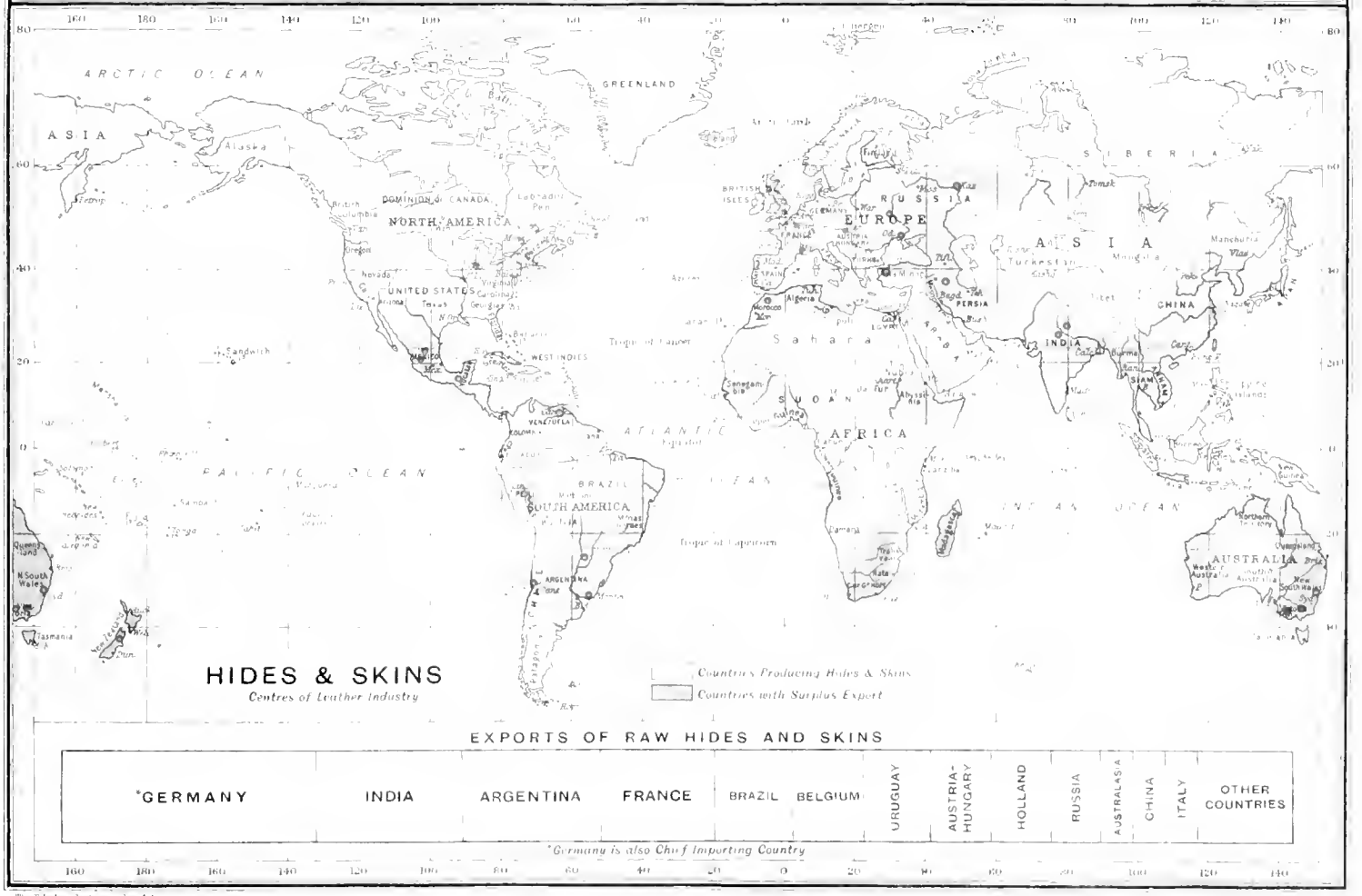
SOURCES OF BRITISH SUPPLY OF WOOL

AUSTRALIA	NEW ZEALAND	BRITISH SOUTH AFRICA	SOUTH AMERICA	BRITISH INDIA	FRANCE	TURKEY	HOLLAND & BELG.	OTHER COUNTRIES



CATTLE IN PRINCIPAL COUNTRIES

EUROPE											
RUSSIA	GERMANY	AUSTRIA-HUNGARY	FRANCE	UNITED KINGDOM	REST OF EUROPE	BRITISH EAST INDIES	UNITED STATES	ARGENTINA	AUSTRALASIA	OTHER COUNTRIES

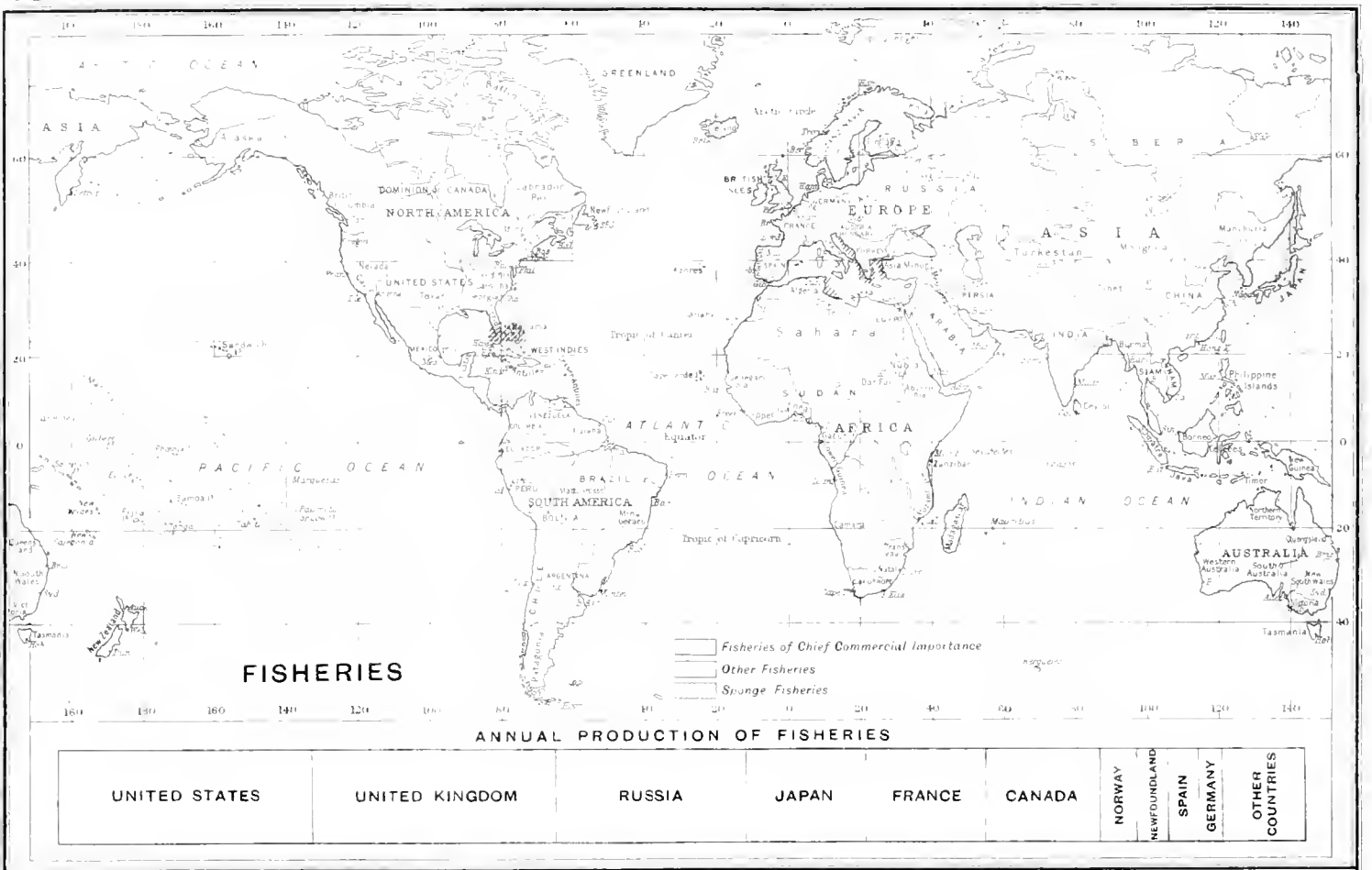


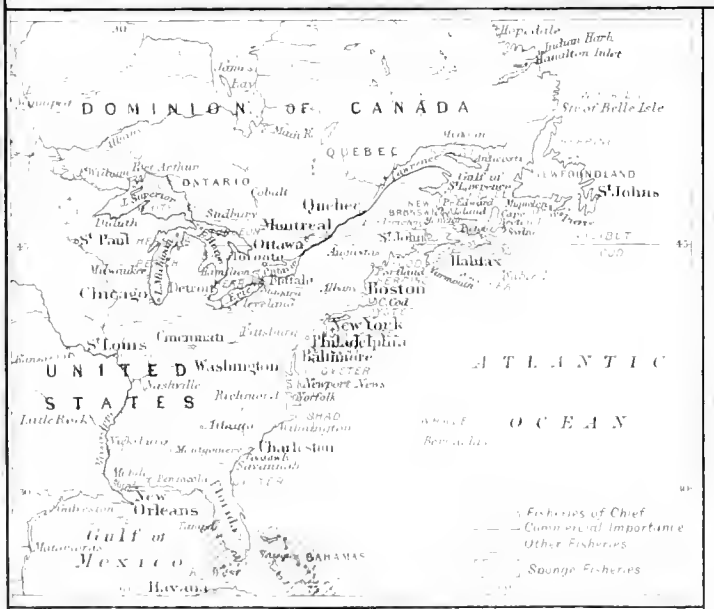
EXPORTS OF RAW HIDES AND SKINS

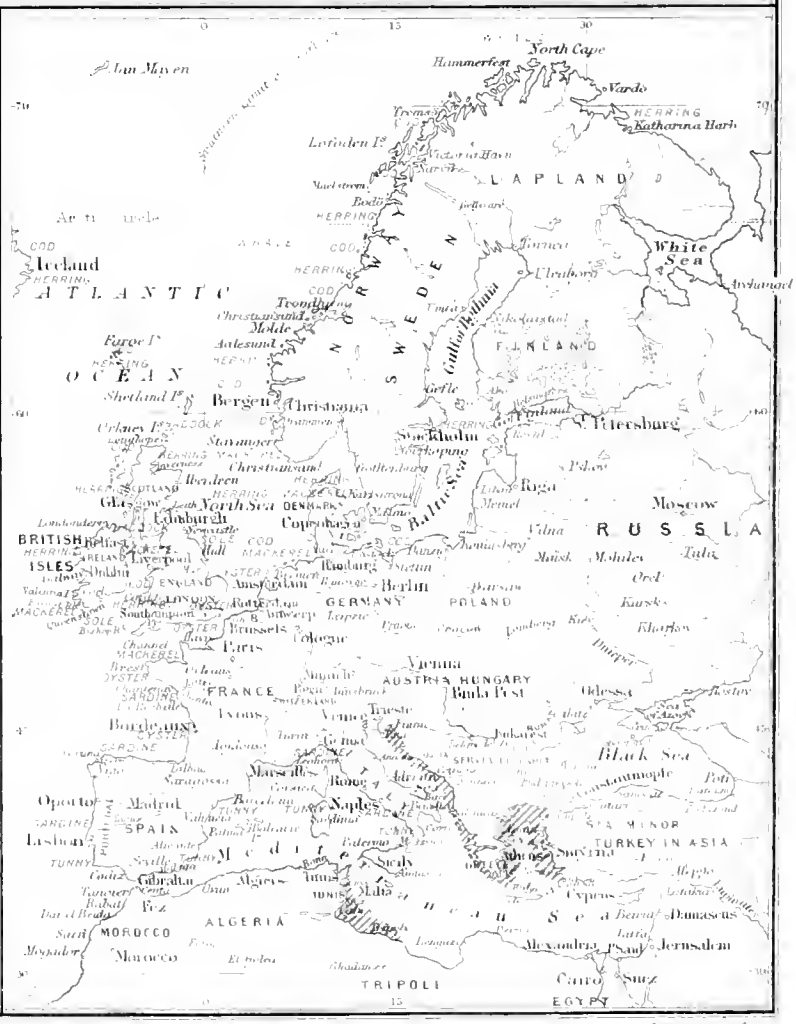
*GERMANY	INDIA	ARGENTINA	FRANCE	BRAZIL	BELGIUM	URUGUAY	AUSTRIA-HUNGARY	HOLLAND	RUSSIA	AUSTRALASIA	CHINA	ITALY	OTHER COUNTRIES

*Germany is also Chief Importing Country

COMPARATIVE BATHY-OROGRAPHICAL SECTIONS





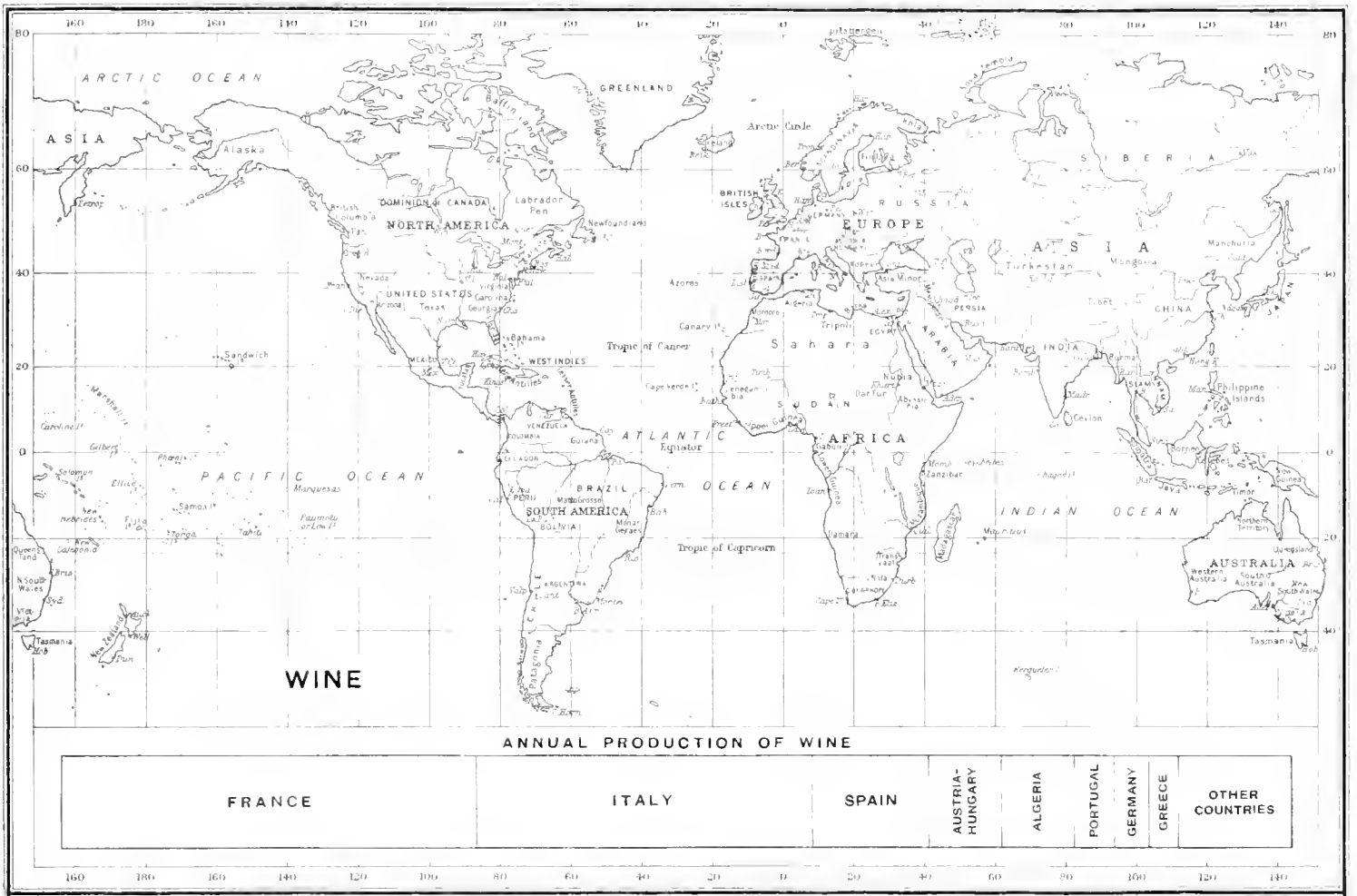


CHIEF KINDS OF FISH LANDED ON COASTS OF UNITED KINGDOM

HERRING	HADDOCK	COD	MACKEREL	OTHER KINDS

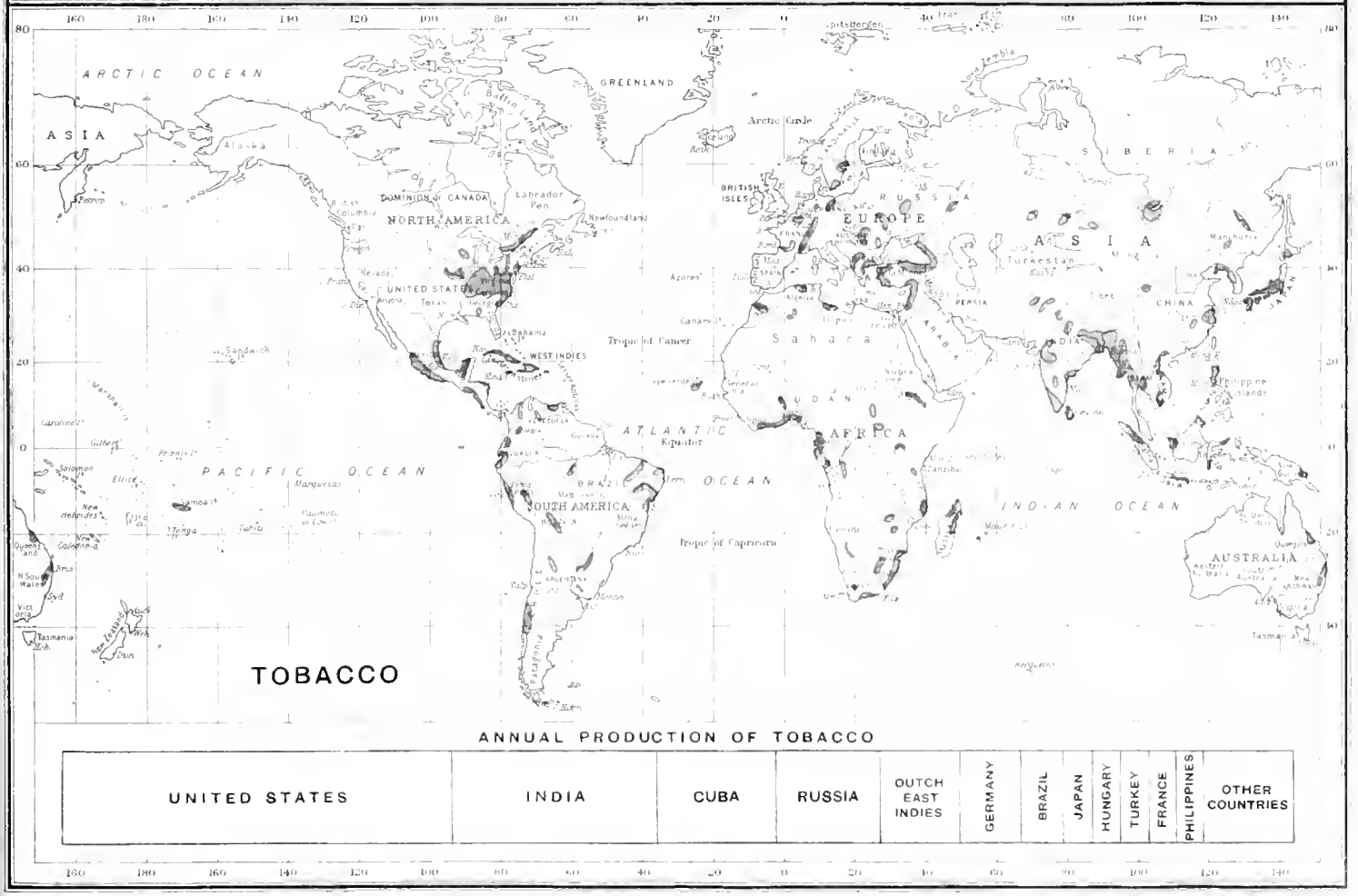
ANNUAL PRODUCTION OF SPONGE

TURKEY	FLORIDA	BAHAMAS	CUBA	TRIPOLI	TUNIS	GREECE	ITALY



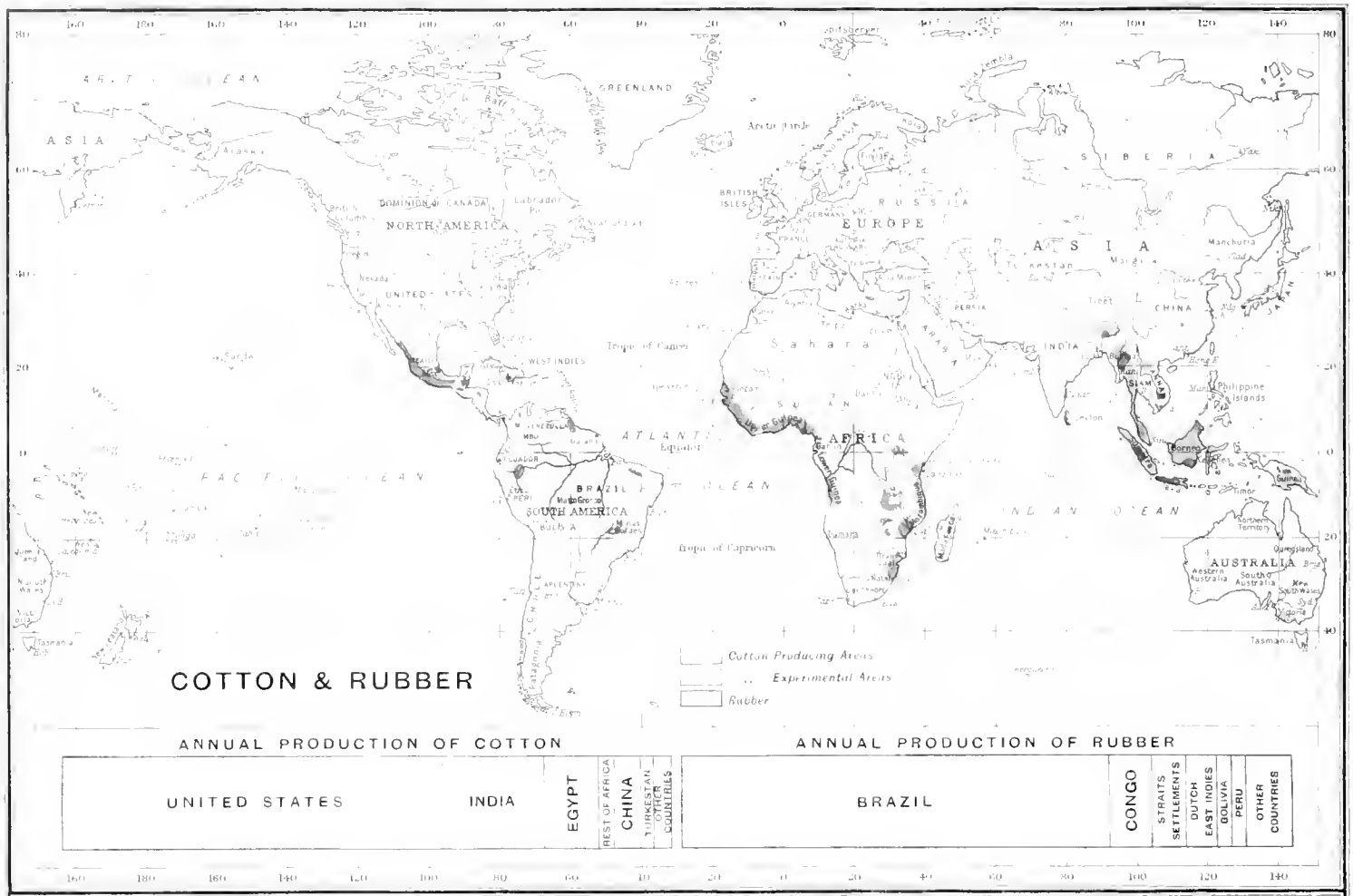
ANNUAL PRODUCTION OF WINE

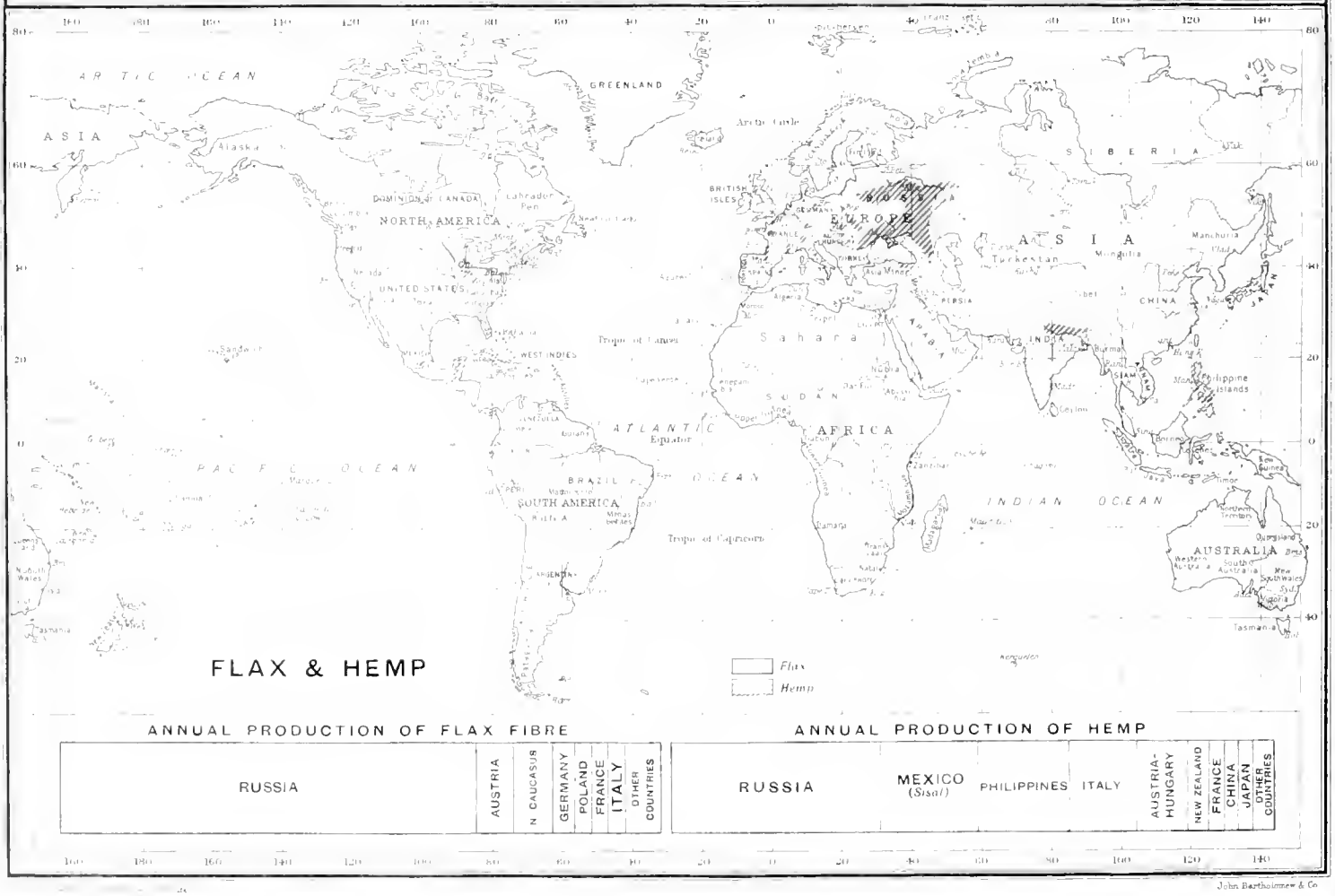
FRANCE	ITALY	SPAIN	AUSTRIA-HUNGARY	ALGERIA	PORTUGAL	GERMANY	GREECE	OTHER COUNTRIES

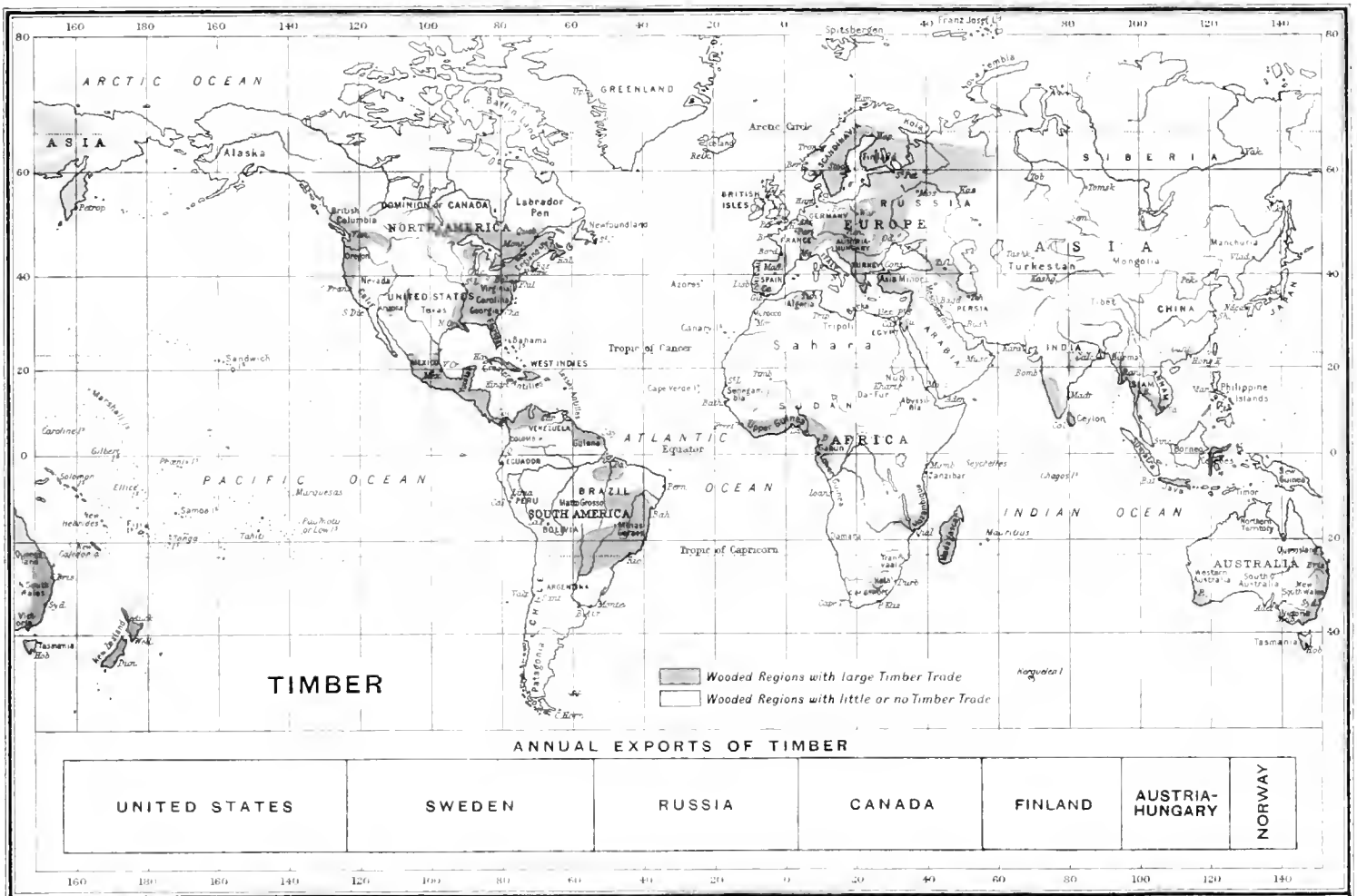


ANNUAL PRODUCTION OF TOBACCO

UNITED STATES	INDIA	CUBA	RUSSIA	OUTCH EAST INDIES	GERMANY	BRAZIL	JAPAN	HUNGARY	TURKEY	FRANCE	PHILIPPINES	OTHER COUNTRIES

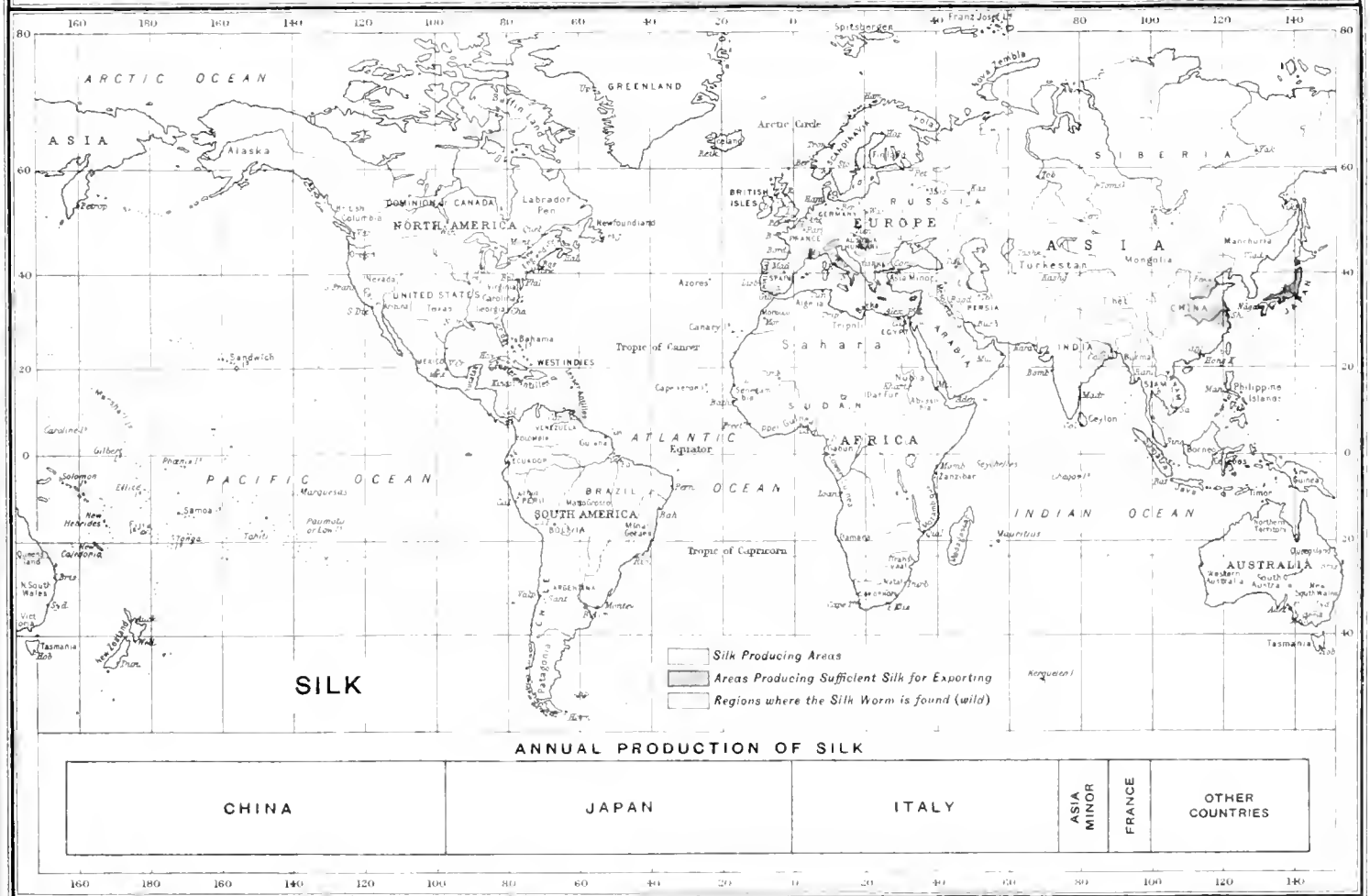






ANNUAL EXPORTS OF TIMBER

UNITED STATES	SWEDEN	RUSSIA	CANADA	FINLAND	AUSTRIA-HUNGARY	NORWAY



ANNUAL PRODUCTION OF SILK

CHINA	JAPAN	ITALY	ASIA MINOR	FRANCE	OTHER COUNTRIES

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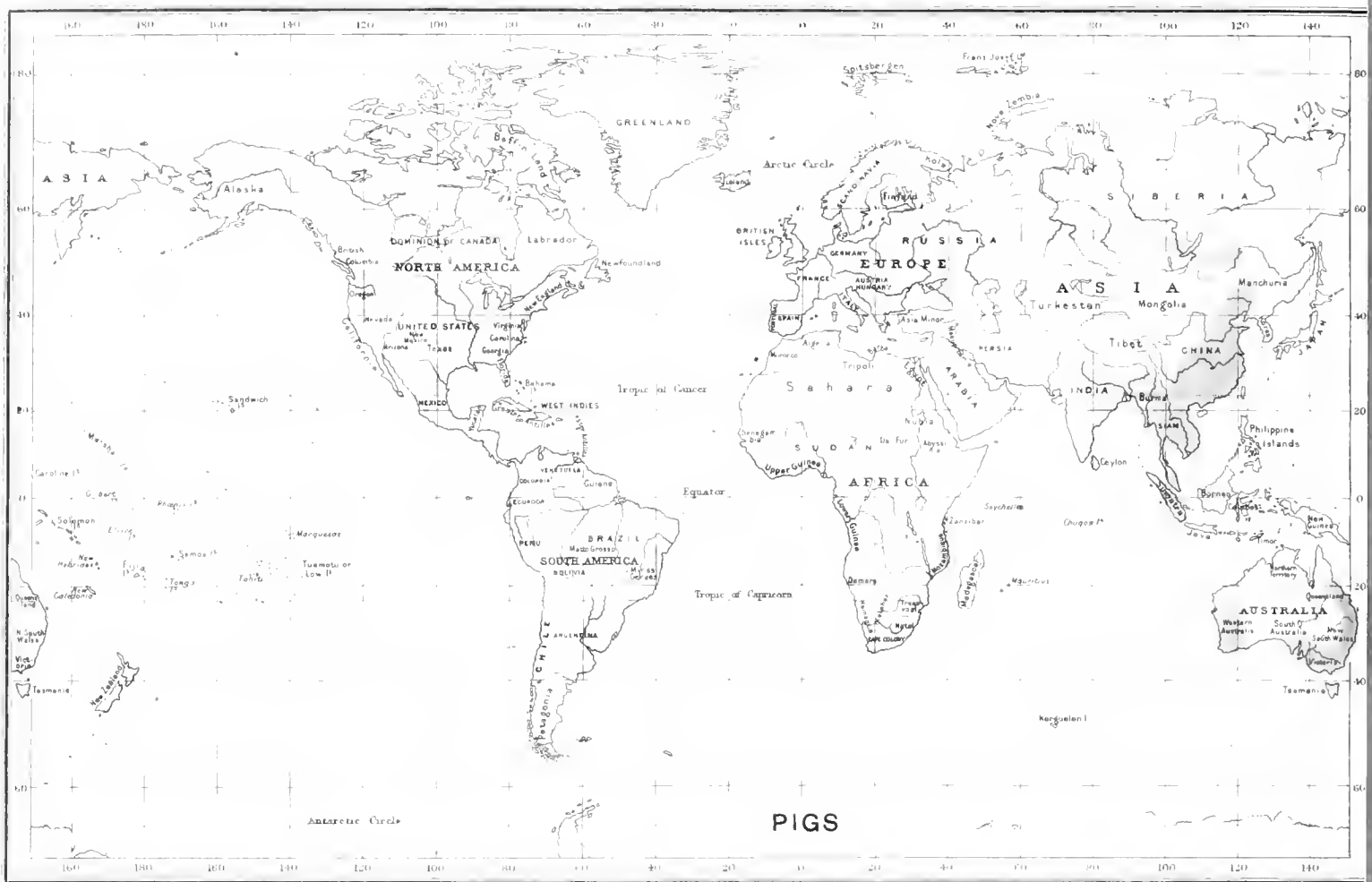
GREENLAND
Arctic Circle
ASIA
Alaska
DOMINION of CANADA
Labrador
NORTH AMERICA
Newfoundland
UNITED STATES
MEXICO
WEST INDIES
Tropic of Cancer
Equator
Tropic of Capricorn
BRAZIL
PERU
SOUTH AMERICA
CHILE
ARGENTINA
EUROPE
RUSSIA
SIBERIA
BRITISH ISLES
GERMANY
FRANCE
SPAIN
Sahara
SUDAN
AFRICA
Tripoli
Algiers
Morocco
PERSIA
ARABIA
Asia Minor
Turkestan
Mongolia
Manchuria
Tibet
CHINA
INDIA
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Java
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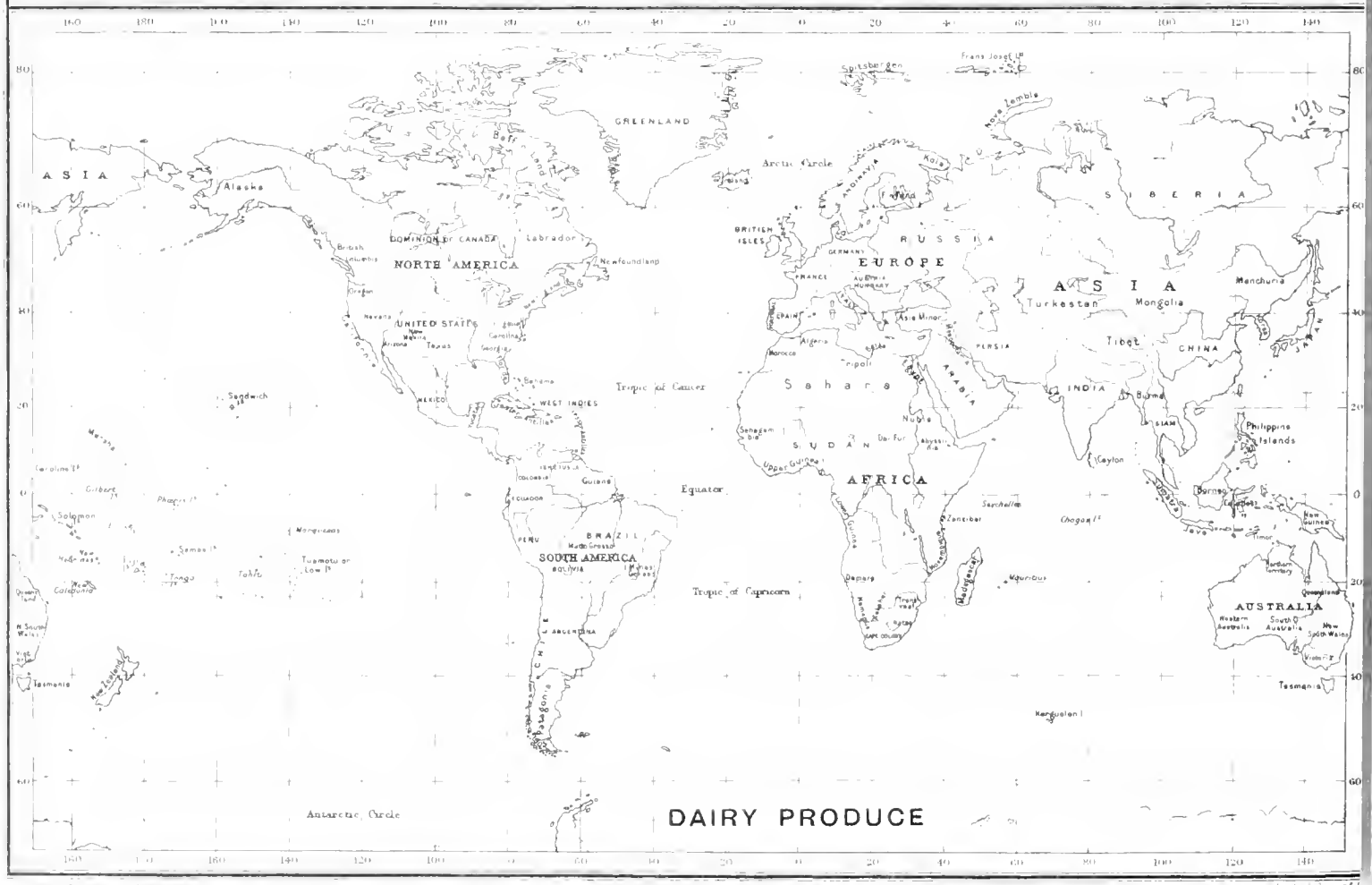
Timor
AUSTRALIA
Tasmania
New Zealand
Antarctic Circle
PIGS


GREENLAND
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Labrador
NORTH AMERICA
Newfoundland
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MEXICO
WEST INDIES
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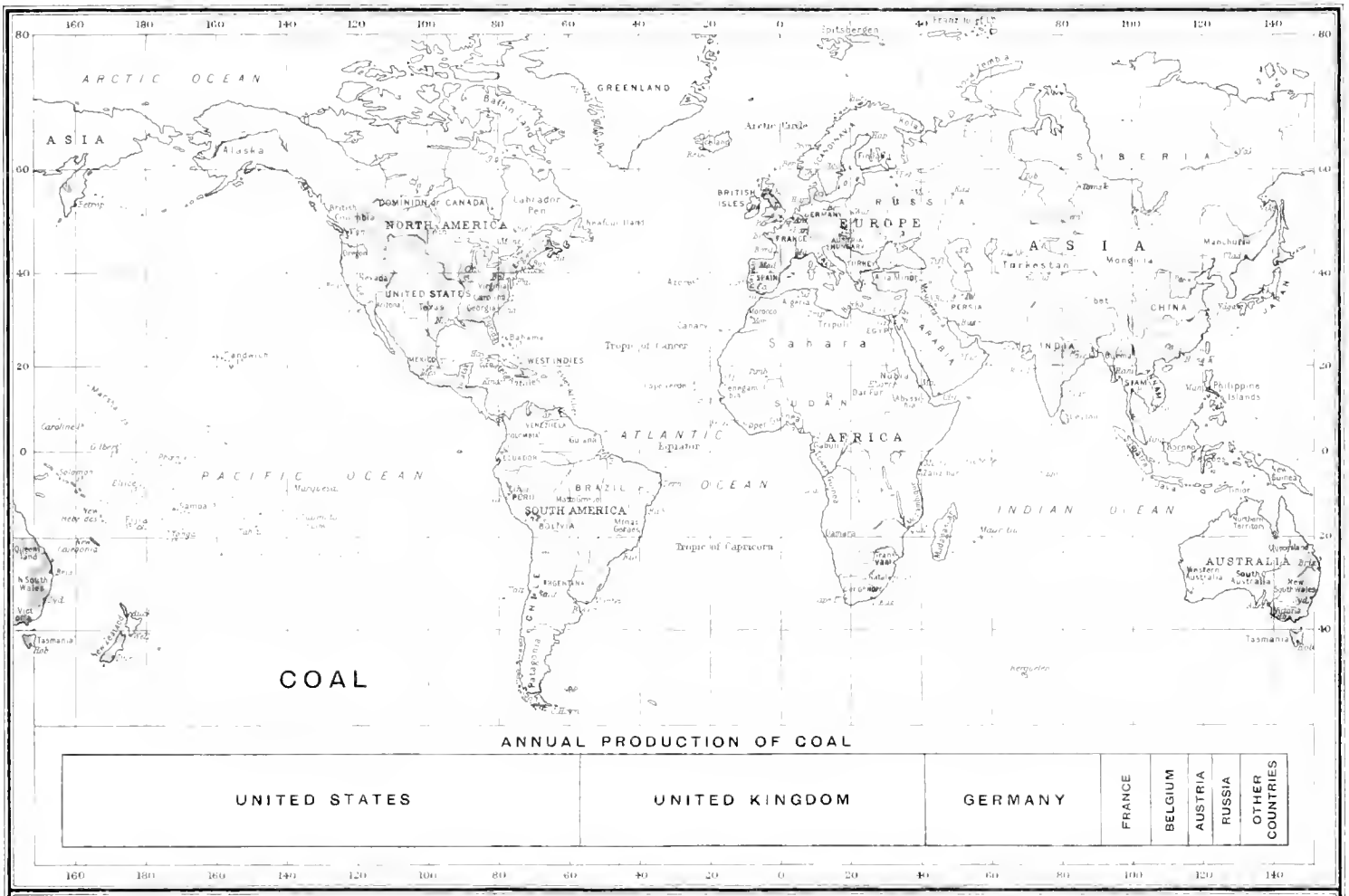
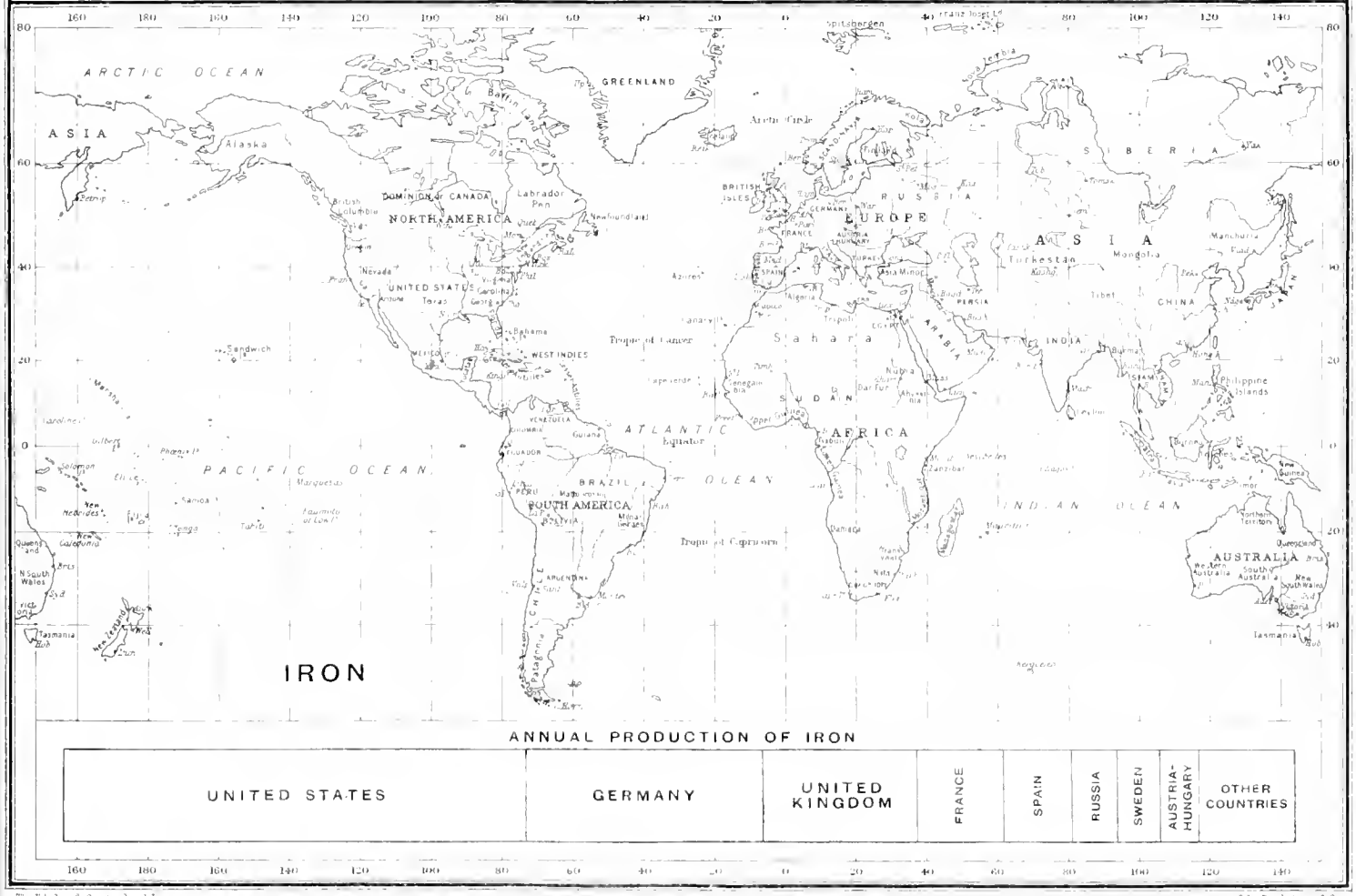
Equator
Tropic of Capricorn
BRAZIL
PERU
SOUTH AMERICA
CHILE
ARGENTINA
EUROPE
RUSSIA
SIBERIA
BRITISH ISLES
GERMANY
FRANCE
SPAIN
Sahara
SUDAN
AFRICA
Tripoli
Algiers
Morocco
PERSIA
ARABIA
Asia Minor
Turkestan
Mongolia
Manchuria
Tibet
CHINA
INDIA
Burma
SIAM
Ceylon
Philippine Islands
Borneo
Java
New Guinea
Timor
AUSTRALIA
Tasmania
New Zealand
Antarctic Circle
DAIRY PRODUCE



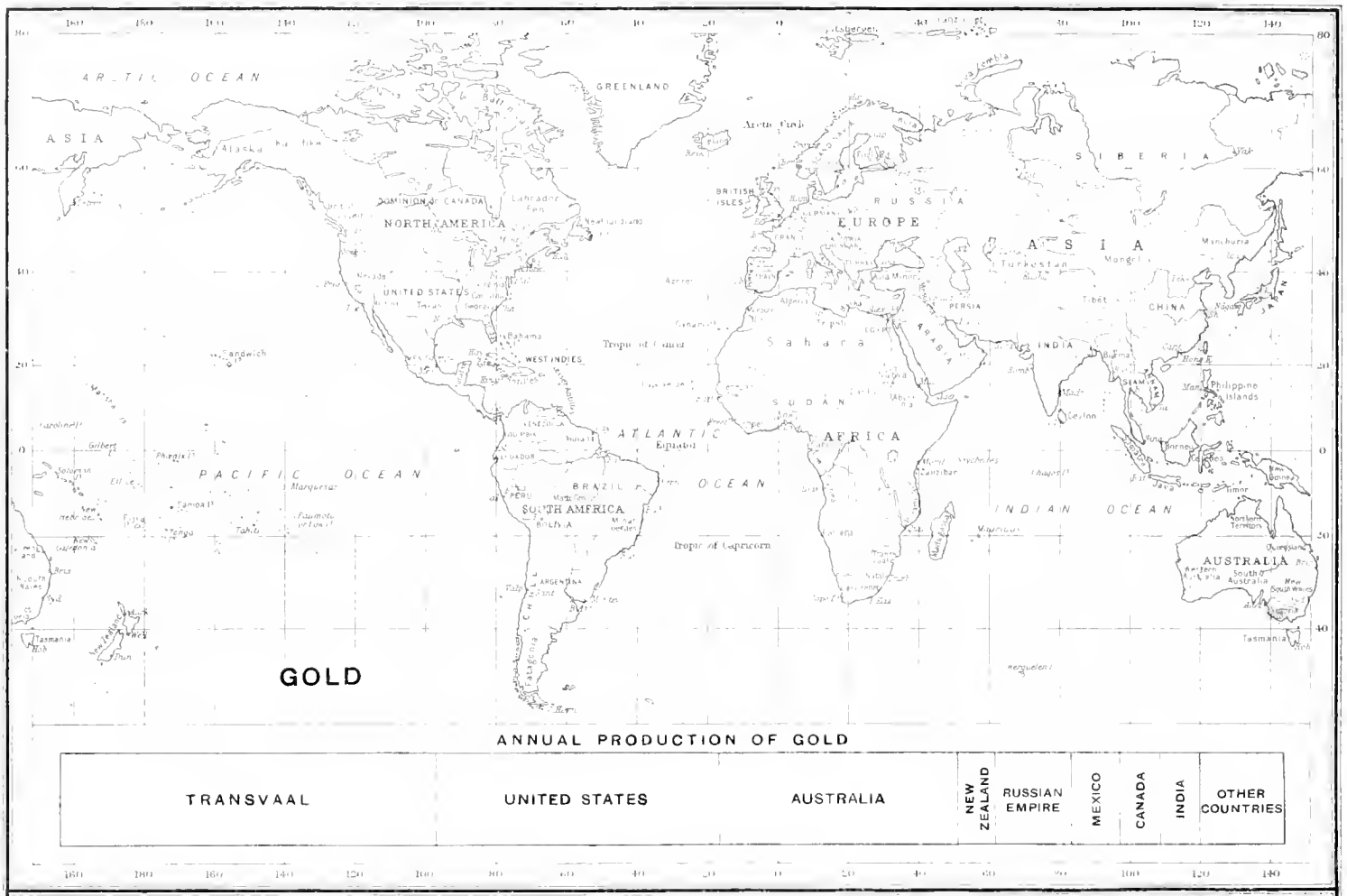
ANNUAL PRODUCTION OF COAL

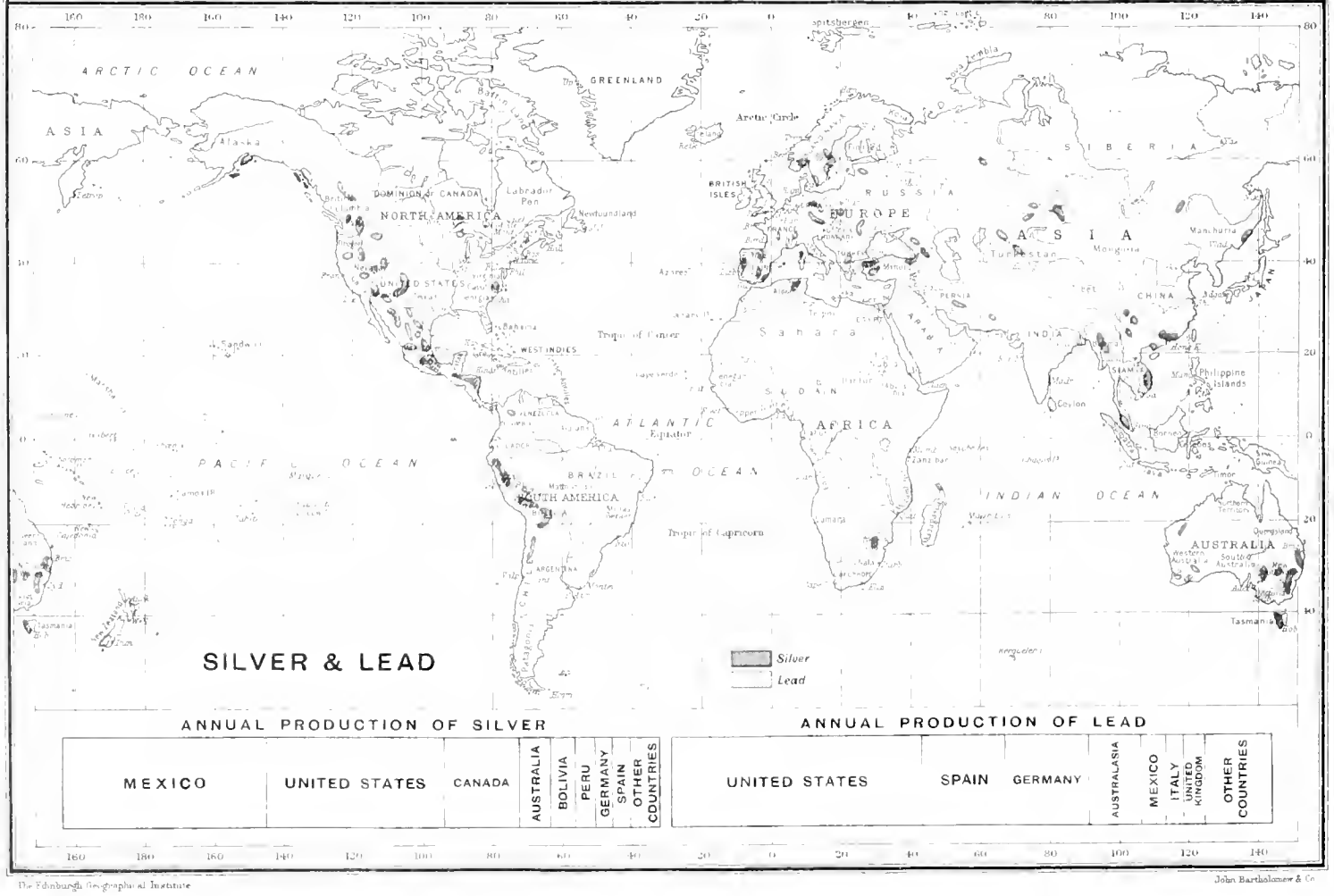
UNITED STATES	UNITED KINGDOM	GERMANY	FRANCE	BELGIUM	AUSTRIA	RUSSIA	OTHER COUNTRIES



ANNUAL PRODUCTION OF IRON

UNITED STATES	GERMANY	UNITED KINGDOM	FRANCE	SPAIN	RUSSIA	SWEDEN	AUSTRIA-HUNGARY	OTHER COUNTRIES





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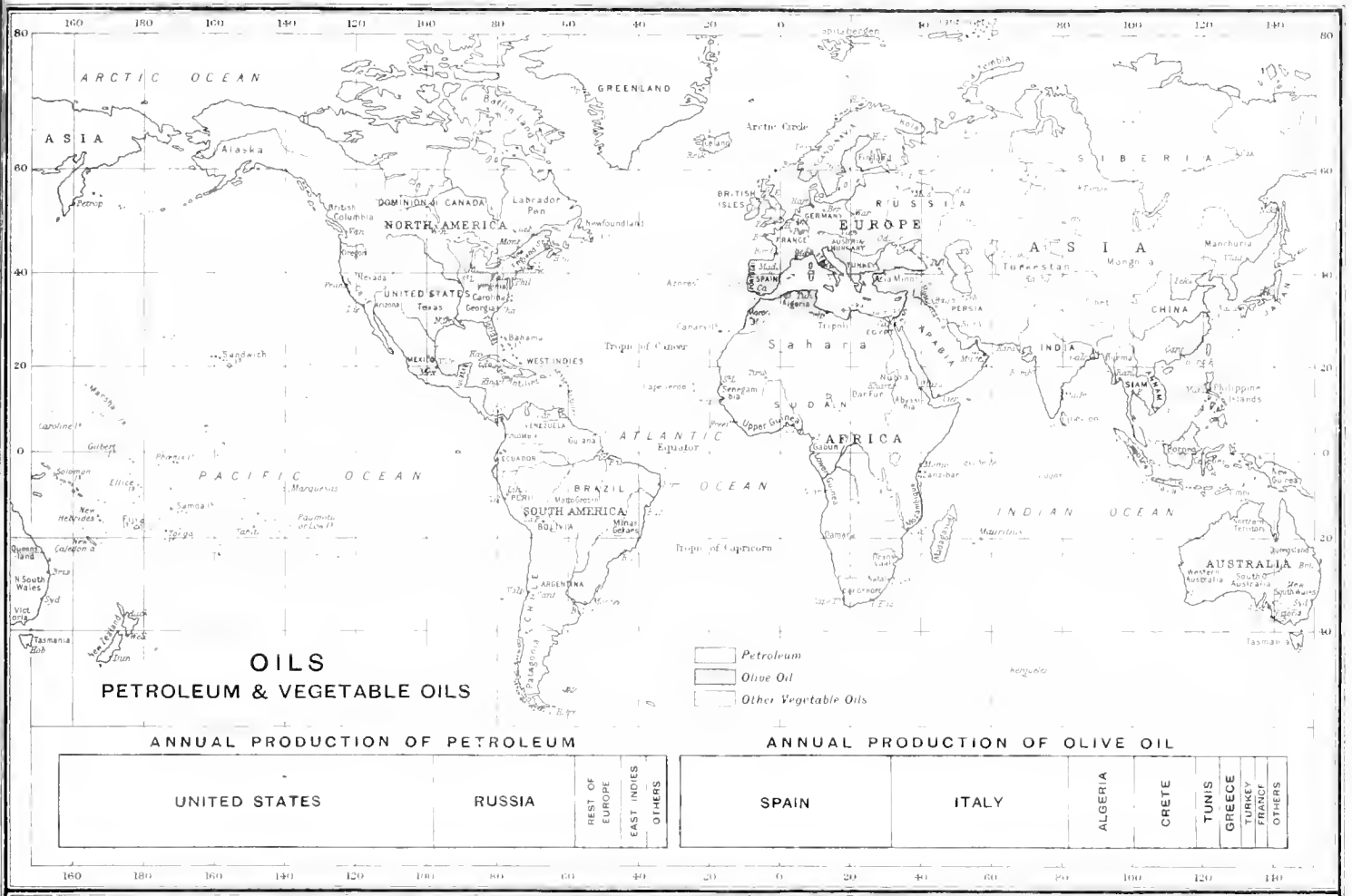


OILS

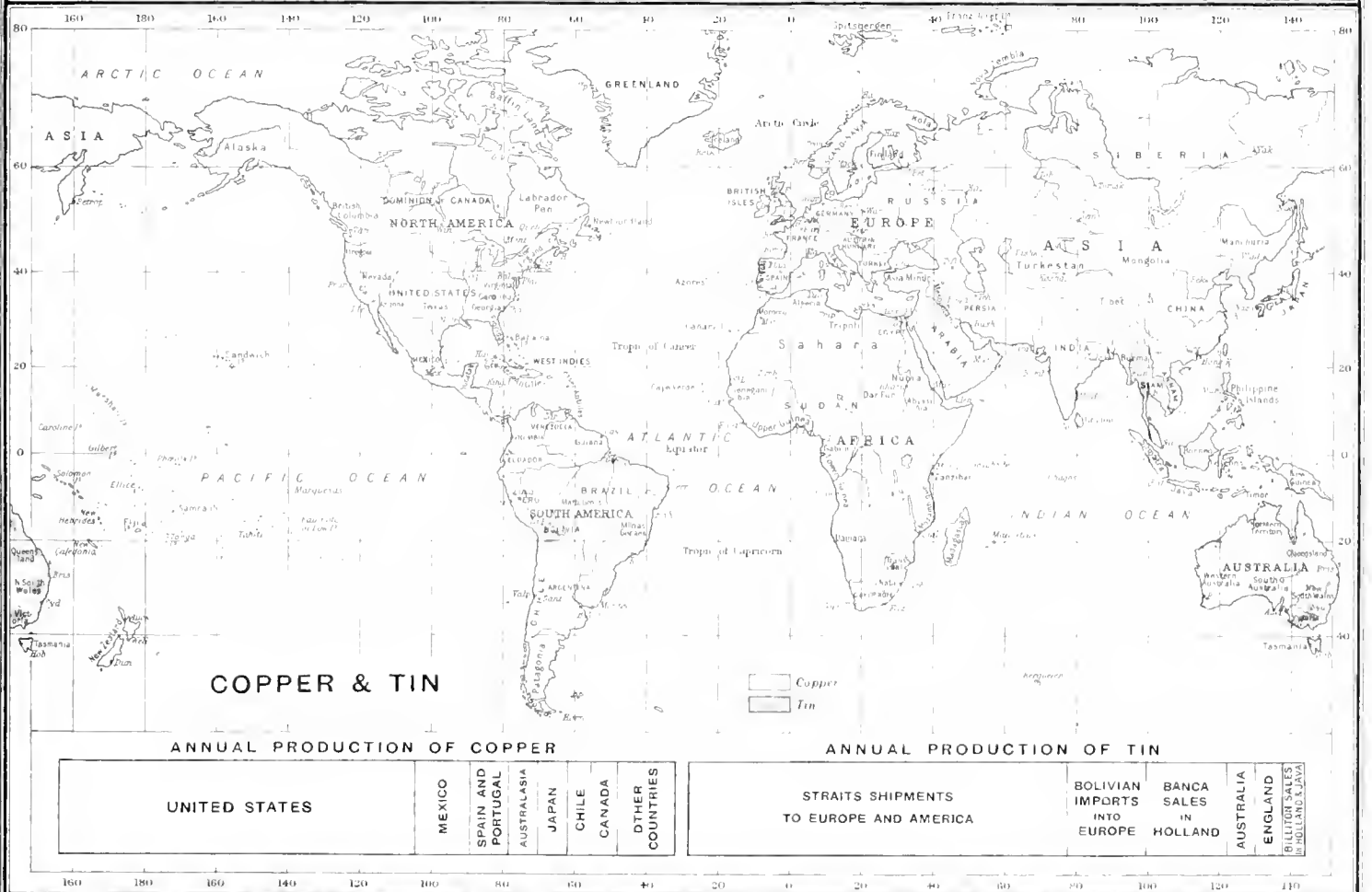
PETROLEUM & VEGETABLE OILS

ANNUAL PRODUCTION OF PETROLEUM

UNITED STATES	RUSSIA	REST OF EUROPE	EAST INDIES	OTHERS

ANNUAL PRODUCTION OF OLIVE OIL

SPAIN	ITALY	ALGERIA	CRETE	TUNIS	GREECE	TURKEY	FRANCE	OTHERS



COPPER & TIN

ANNUAL PRODUCTION OF COPPER

UNITED STATES	MEXICO	SPAIN AND PORTUGAL	AUSTRALASIA	JAPAN	CHILE	CANADA	OTHER COUNTRIES

ANNUAL PRODUCTION OF TIN

STRAITS SHIPMENTS TO EUROPE AND AMERICA	BOLIVIAN IMPORTS INTO EUROPE	BANCA SALES IN HOLLAND	AUSTRALIA	ENGLAND	BILLITON SALES IN HOLLAND & JAVA

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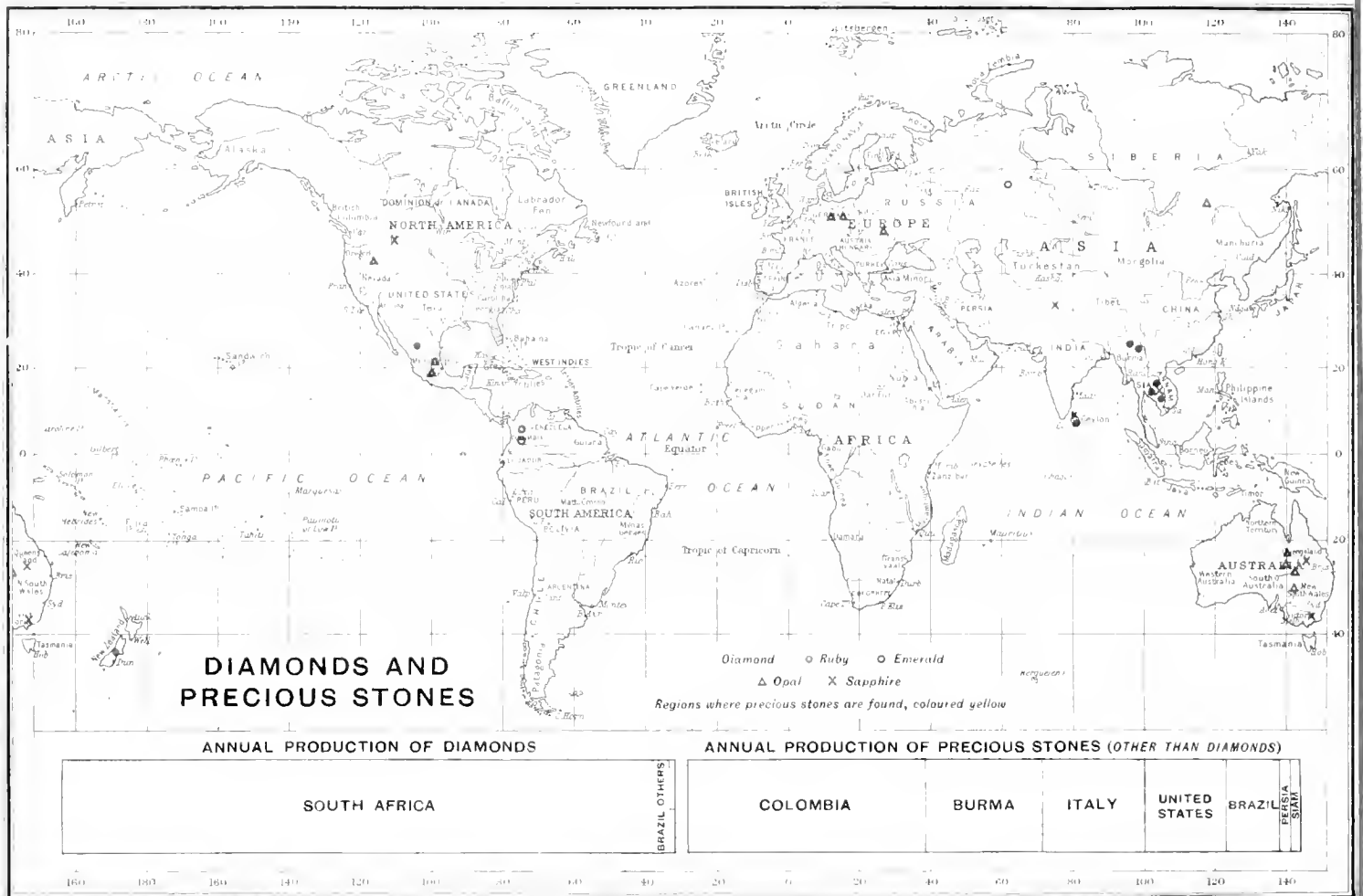


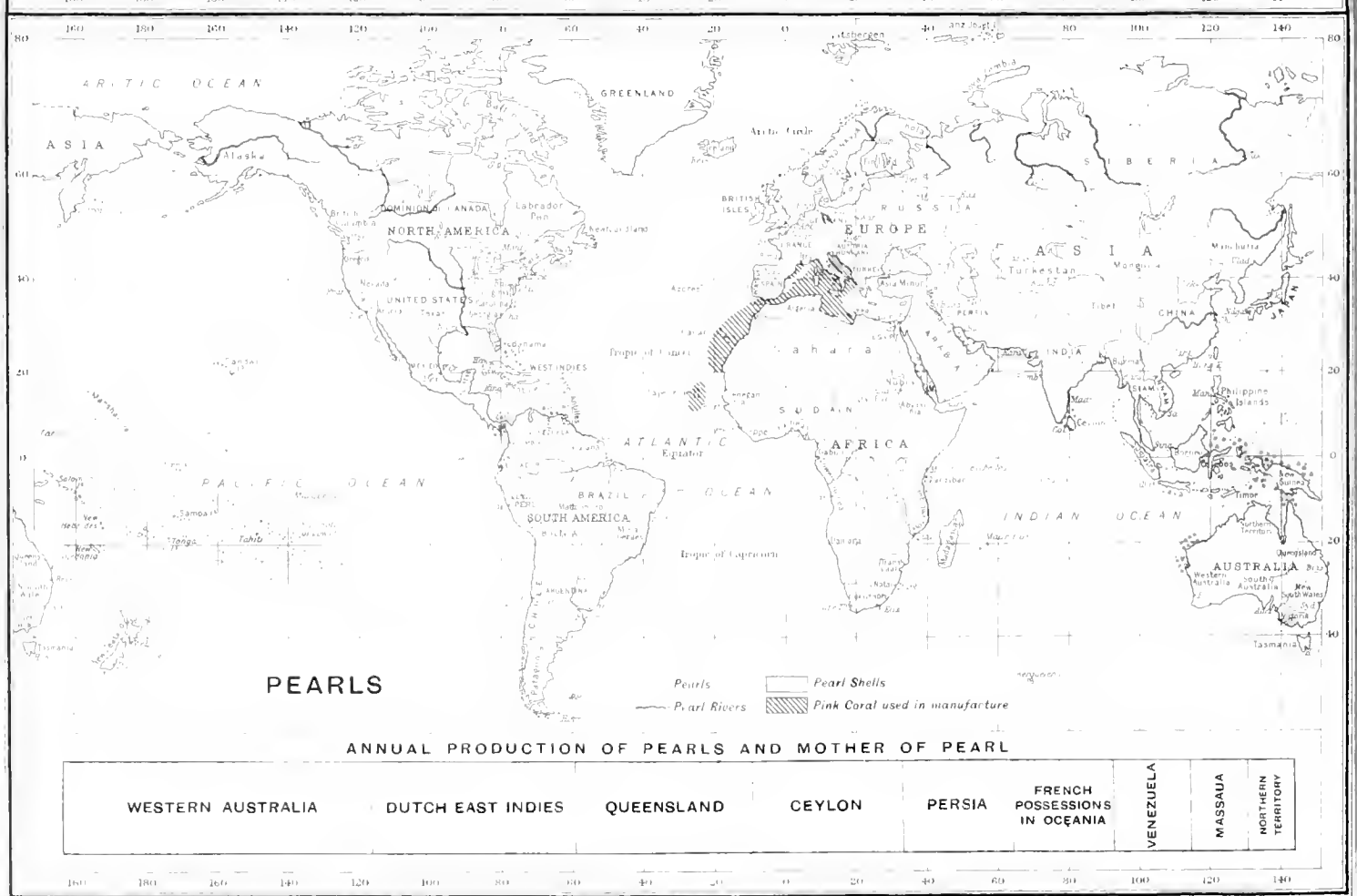
DIAMONDS AND PRECIOUS STONES

ANNUAL PRODUCTION OF DIAMONDS

SOUTH AFRICA	BRAZIL, OTHERS

ANNUAL PRODUCTION OF PRECIOUS STONES (*OTHER THAN DIAMONDS*)

COLOMBIA	BURMA	ITALY	UNITED STATES	BRAZIL	PERSIA	SIAM



PEARLS

ANNUAL PRODUCTION OF PEARLS AND MOTHER OF PEARL

WESTERN AUSTRALIA	DUTCH EAST INDIES	QUEENSLAND	CEYLON	PERSIA	FRENCH POSSESSIONS IN OCEANIA	VENEZUELA	MASSAUA	NORTHERN TERRITORY

The Edinburgh Geographical Institute

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